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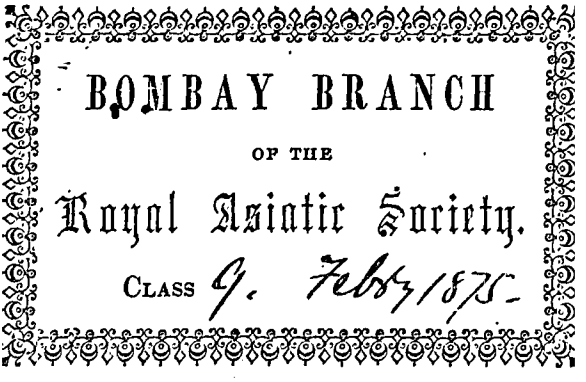

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SELECTIONS

FROM THE

RECORDS OF GOVERNMENT,

NORTH-WESTERN PROVINCES.

SECOND SERIES.

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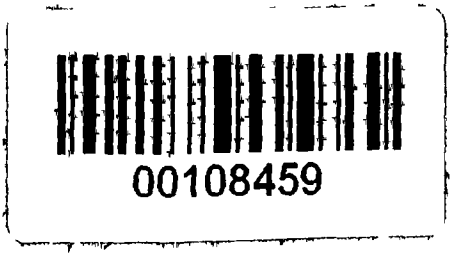

Page.

No. 2.—Report by R. M. MILNE, ESQ., M.B., Officiating Superintendent of Vaccination, Benares Circle, ... 112

„ 3.—Report by J. RICHARDSON, ESQ., M.B., Superintendent of Vaccination, Allahabad and Jhansie Circle, ... 125

„ 4.—Report by R. PRINGLE, ESQ., M.D., Superintendent of Vaccination, Agra and Meerut Circle, ... 137

„ 5.—Appendix to the above, by Surgeon R. PRINGLE, M.D., Superintendent of Vaccination, Agra and Meerut Circle, ... 163

„ 6.—Report by T. MURRAY, ESQ., M.D., Civil Surgeon and Superintendent of Vaccination, Ajmere Circle, ... 165

„ 7.—Government Orders on above, ... 166

ART. VI.—FLOODING OF THE TOWNS OF JOUNPORE AND AZIMGURH :—

No. 1.—Resolution of the Lieutenant-Governor authorizing Commissioners of Allahabad and Benares Divisions to sanction any necessary expenditure, ... 175

„ 2.—Letter from Officiating Secretary to Government, North-Western Provinces, to the Government of India, Home Department, ... 176

„ 3.—Letter from Commissioner, Allahabad Division, to the Officiating Secretary to the Government of the North-Western Provinces, suggesting measures for relief, ... 179

„ 4.—Government Orders on above Report, ... 186

Page.

No. 5.—Report by J. D. SANDFORD, Esq., Officiating Magistrate, ... 187

„ 6.—Report by DR. WOOD, Superintendent of Jail, ... 196

„ 7.—Government Orders on the above Reports, ... 202

ART VII.—BOOKS SUBMITTED BY NATIVE WRITERS :—

No. 1.—Memorandum by Director of Public Instruction on an Oordoo Manuscript entitled " Zukaat-ul-Hikmat :" by MAHOMED ABDOOL HUQQ, of Khairabad, ... 205

„ 2.—Government Orders sanctioning an honorarium of Rs. 200 to the author, ... 207

ART. VIII.—DRAINAGE AND IMPROVEMENT OF THE SEHARUNPORE AND MOOZUFFERNUGGUR DISTRICTS, NORTH-WESTERN PROVINCES :—

No. 1.—Resolution of the Lieutenant-Governor on a report on the condition of the west Kalee Nuddee, by LIEUTENANT MARSHALL, R.E., ... 208

„ 2.—From Superintending Engineer, 1st Circle, to Joint Secretary, Irrigation Branch, forwarding LIEUTENANT MARSHALL'S Report, ... 210

„ 3.—Report by LIEUTENANT G. F. L. MARSHALL, R.E., on the condition of the west Kalee Nuddee in the Seharunpore and Moozuffernuggur Districts, ... 215

Page.

ART. IX.—REGISTERED PUBLICATIONS DURING 1871 :—

No. 1.—Report by M. KEMPSON, ESQ., M.A., Director of Public Instruction, North-Western Provinces, on the publications registered at Allahabad under Act XXV. of 1867 during the year 1871, ... 246

„ 2.—Note by C. J. LYALL, ESQ., Officiating Under-Secretary to Government, North-Western Provinces, on the above Report, 253

„ 3.—Government Orders on above, ... 260

ART. X.—FEVER IN THE SOTE VALLEY, PERGUNNAH SUMBHUL, DISTRICT MORADABAD :—

No. 1.—Report by C. A. DANIELL, ESQ., Magistrate of Moradabad, on the Fever in the Sote Valley, Pergunnah Sumbhul, ... 263

„ 2.—Government Orders on above, ... 272

ART. XI.—MEMORANDUM ON CERTAIN WORKS RECEIVED FROM PERSIA :—

No. 1.—Memorandum by M. KEMPSON, ESQ., M.A., Director of Public Instruction, North-Western Provinces, on a collection of the writings of Qaani, Faroghi, and Jalal, edited by the latter, with marginal notes, 273

„ 2.—Government Orders on above, ... 276

ART. XII.—TWO SCIENTIFIC TREATISES IN OORDOO :—

No. 1.—Memorandum by MR. KEMPSON on a Treatise on Astronomy: by MOULVIE SAMSAM-UL-HUQQ of Sheikhpoora, ... 277

„ 2.—Ditto ditto on Dabistan-i-Danish Amoz: by MOULVIE OBYD-OOLLAH-UL-OBYDI, Hooghly College, ... 278

„ 3.—Government Orders on the above Memo. 279

Page.

ART. XIII.—MERITORIOUS BOOKS BY NATIVE AUTHORS :—

No. 1.—Memorandum by M. KEMPSON, ESQ., M.A., Director of Public Instruction, North-Western Provinces, on "Silsilat-ul-Alum," a series of 28 Vols. of Mathematical Works in Oordoo: by MOONSHEE ZAKA-OOLLAH, Head Master, Government Normal School, Delhi, ... 280

„ 2.—Government Orders on above, ... 282

ART. XIV.—REPORT OF THE ACTUAL OUTTURN OF COTTON IN THE NORTH-WESTERN PROVINCES, FOR THE YEAR 1871-72 :—

No. 1.—Report by the Board of Revenue, North-Western Provinces, on the actual outturn of cotton for 1871-72, ... 283

„ 2.—Government Orders on above, ... 286

ART. XV.—MUNICIPAL FREE SCHOOLS, BENARES :—

No. 1.—Report by Commissioner of the Benares Division relating to the ragged Schools in the city of Benares, ... 290

„ 2.—Report by the Magistrate and President, Municipal Committee, Benares, ... *ib.*

„ 3.—Memorandum by M. KEMPSON, ESQ., M.A., Director of Public Instruction, North-Western Provinces, on the above Reports, 296

„ 4.—Government Orders on the above reports, 297

ART. XVI.—REPORT ON THE BUTESUR FAIR OF 1871 :—

No. 1.—Report by F. BAKER, ESQ., Assistant Magistrate and Collector of Agra, ... 300

„ 2.—Government Orders on the above, ... 309

Page.

ART. XVII.—REPORT ON THE ALLAHABAD PUBLIC LIBRARY AND MUSEUM, FOR THE YEAR 1871-72 :—

No. 1.—Report by CAPTAIN C. A. DODD, Secretary to the Public Museum and Library Committee, ... 311

„ 2.—Government Orders on above, ... 317

ART. XVIII.—VACCINATION RETURNS, NORTH-WESTERN PROVINCES FOR 1871-72 :—

No. 1.—Report by SURGEON-MAJOR F. PEARSON, Superintendent-General of Vaccination, North-Western Provinces, ... 319

„ 2.—Government Orders on the above, ... 334

ART. XIX.—REPORT ON THE METEOROLOGY OF THE NORTH-WESTERN PROVINCES FOR 1871 :—

No. 1.—Report by Reporter on Meteorological Observations, North-Western Provinces, ... 347

„ 2.—Government Orders on above, ... 377

ART. XX.—REPORT ON THE GOVERNMENT GARDENS, NORTH-WESTERN PROVINCES, FOR 1871-72 :—

No. 1.—Report by Superintendent, Botanical Gardens, North-Western Provinces, ... 382

„ Government Orders on above, ... 393

ART. XXI.—BOOKS SUBMITTED BY NATIVE WRITERS :—

No. 1.—Memorandum by Director of Public Instruction on an Oordoo Manuscript entitled " Mahbub-ul-Qulub :" by BISHESHWAR PERSHAD, of Gyanpore School, ... 397

Page.

No. 2.—Government Orders sanctioning a reward of Rs. 150 to the author, ... 401

„ 3.—Memorandum by the Director of Public Instruction on an Oordoo Manuscript entitled "Tambih-ut-Talibin:" by MAHOMED MOOBARUK-OOLLAH, Muttra, ... 401

„ 4.—Memorandum by Director of Public Instruction on an Oordoo Manuscript entitled "Risalah Faiz-i-Amm:" by SYUD TAHAWWUR ALI, Teacher of the Kurrah School, Allahabad District, ... 404

„ 5.—Government Orders on the above-mentioned memo., sanctioning an honorarium of Rs. 200 to SYUD TAHAWWUR ALI, ... 407

„ 6.—Memorandum by Director of Public Instruction on an Oordoo Manuscript entitled "Talim-un-Niswan-i-Hund:" by MOONSHEE CHATUR BHOJ SAHAI, Beawur, *ib.*

„ 7.—Memorandum by Director of Public Instruction on an Oordoo Manuscript entitled "Mukhzan-i-Ulum:" by LULTA PERSHAD, Master of Mission School, Bacongunge, Cawnpore, ... 410

„ 8.—Memorandum by Director of Public Instruction on an Oordoo Manuscript entitled "Tashrih-ul-Faras:" by MOONSHEE AJOODHYA PERSHAD, Bareilly College, ... 412

„ 9.—Memorandum by Director of Public Instruction on an Oordoo Manuscript entitled "Ainak-i-Khird:" by ABDUR RAHIM, Agra, ... 414

„ 10.—Government Orders on the above memorandum, sanctioning a reward of Rs. 100 to the author, ... 415

Page.

No. 11.—Memorandum by Director of Public Instruction on an Oordoo translation of "Butler's Analogy," Part I: by MR. WILLIAMS, St. John's College, Agra, ... 416

„ 12.—Government Orders on above, sanctioning an honorarium of Rs. 500 to the translator, ... 422

„ 13.—Memorandum by Director of Public Instruction on an Oordoo Manuscript entitled "Rounaq-i-Hind:" by MOONSHEE HOSEIN ALI, Vakeel, Mirzapore, ... 424

„ 14.—Government Orders on above, sanctioning a reward of Rs. 250 to the author, 428

ART. XXII.—EFFECT OF INCREASED POPPY CULTIVATION ON THE USE OF OPIUM:—

No. 1.—Report by the Secretary to the Board of Revenue, North-Western Provinces, ... 429

„ 2.—Government Orders on above, ... 435

ART. XXIII.—KATHA NUDDEE AND THE SWAMPS IN ITS VALLEY:—

No. 1.—Report by CAPTAIN C. W. J. HARRISON, R.E., Executive Engineer (on special duty), Eastern Jumna Canal, on the condition of the Katha Nuddee and the swamps in its valley, ... 437

„ 2.—Memorandum by the Superintending Engineer, 2nd Circle, Irrigation Works, on the Sanitary condition of the Seharunpore and Moozuffernuggur Districts, ... 488

Page.

No. 3.—Note by Officiating Chief Engineer, Irrigation Works, North-Western Provinces, ... 493

„ 4.—Minute by His Honor the Lieutenant-Governor, North-Western Provinces, ... 498

ART. XXIV.—VISIT OF THE LIEUTENANT-GOVERNOR TO THE THOMASON COLLEGE OF CIVIL ENGINEERING, ROORKEE, ... 501

ART. XXV.—REPORT ON THE VERNACULAR NEWSPAPERS AND PERIODICALS PUBLISHED IN THE NORTH-WESTERN PROVINCES DURING 1872:—

No. 1.—Report by M. KEMPSON, ESQ., M.A., Director of Public Instruction, North-Western Provinces, on the Vernacular Newspapers and Periodicals published in the North-Western Provinces during 1872, ... 511

„ 2.—Government Orders on the above, ... 523

ART. XXVI.—RESULTS OF THE MEASURES TAKEN FOR THE RELIEF OF THE INHABITANTS OF JOUNPORE:—

No. 1.—Report by the Vice-President and the Secretary to the Jounpore Floods Relief Committee on the above, ... 529

„ 2.—Government Orders on above, ... 534

ART. XXVII.—PUBLICATIONS REGISTERED BY THE CURATOR OF GOVERNMENT BOOKS UNDER ACT XXV. OF 1867 DURING 1872:—

No. 1.—Report by M. KEMPSON, ESQ., M. A., Director of Public Instruction, North-Western Provinces, ... 535

Page.

No. 2.—From M. KEMPSON, ESQ., M.A., Director of Public Instruction, North-Western Provinces, to the Curator of Government Books, North-Western Provinces, enclosing extract from the orders of Government on the above Report for 1871, ... 546

„ 3.—Government Orders on the above, ... 548.

ART. XXVIII.—REPORT ON THE WORKING OF THE DISTRICT DAKS IN THE NORTH-WESTERN PROVINCES FOR THE YEAR 1872-73 :—

No. 1.—Report by C. W. HUTCHINSON, ESQ., Post-master General, North-Western Provinces, ... 551

„ 2.—From C. W. HUTCHINSON, ESQ., Post-master General, North-Western Provinces, to Secretary to Government, North-Western Provinces, submitting statistics showing the amount of correspondence passing through the Post-office, ... 562

„ 3.—Government Orders on above, ... 567

ART. XXIV.—REPORT ON THE ACTUAL OUTTURN OF THE COTTON CROP, NORTH-WESTERN PROVINCES, FOR 1872-73 :—

No. 1.—Report by the Board of Revenue on the actual outturn of Cotton for 1872-73, ... 568.

„ 2.—Report by R. T. HOBART, ESQ., Deputy Collector of Etah, on the above, ... 591

„ 3.—Government Orders on above, ... 598.

Page.

ART. XXX.—DISCONTINUANCE OF EXPERIMENTS FOR CINCHONA CULTIVATION IN THE NORTH-WESTERN PROVINCES :—

No. 1.—Memorandum by the Superintendent of Botanical Gardens, North-Western Provinces, on the above, ... 602

No. 2.—From Secretary to Government, North-Western Provinces, to Government of India, in the Department of Agriculture, Revenue and Commerce, forwarding copy of the above memo. with remarks, ... 603

ART. XXXI.—ANNUAL REPORT ON GOVERNMENT GARDENS, NORTH-WESTERN PROVINCES, FOR 1872-73 :—

No. 1.—Report by W. JAMESON, ESQ., Surgeon-Major, Superintendent, Botanical Gardens, North-Western Provinces, on the Government Gardens, North-Western Provinces, for 1872-73, ... 604

„ 2.—Government Orders on above, ... 621

ART. XXXII.—REPORT ON THE METEOROLOGY OF THE NORTH-WESTERN PROVINCES FOR 1872 :—

No. 1.—Report by M. THOMSON, ESQ., M.D., Reporter on Meteorological Observations,... 627

„ 2.—Government Orders on above, ... 657

ART. XXXIII.—OPERATIONS OF THE BOOLUNDSHUHUR MODEL FARM DURING RUBBEE HARVEST OF 1872-73 :—

No. 1.—From Commissioner, Meerut Division, to Government, North-Western Provinces, covering Collector's Report on above, ... 662

Page.

No. 2.—Report by H. D. WILLOCK, ESQ., Collector of Boolundshuhur, ... 663

„ 3.—Supplementary Report by J. SIMPSON, ESQ., Superintendent, Model Farm, ... 668

„ 4.—Report by J. SIMPSON, ESQ., on the experiments made with Messrs. Crompton and Co.'s "Patent Animal Guano," ... 673

„ 5.—From Secretary to Government, North-Western Provinces, to Board of Revenue, North-Western Provinces, forwarding a copy of the Report with remarks, ... 684*a*

ART. XXXIV.—SPECIAL EDUCATION OF MAHOMEDANS:—

No. 1.—From the Director of Public Instruction, North-Western Provinces, to the Secretary to Government, North-Western Provinces, submitting a paper on the above, ... 685

„ 2.—Government Orders on above, ... 690

SELECTIONS

FROM THE

RECORDS OF THE GOVERNMENT

OF THE

NORTH-WESTERN PROVINCES.

SECOND SERIES.

Art. I.

BOTANICAL GARDENS, N.-W. PROVINCES.

[No. 1.] *Report by* W. JAMESON, ESQ., *Surgeon Major, Superintendent, Botanical Gardens, North-Western Provinces (No.* 393*).—Dated Saharunpore, the* 20*th April,* 1871.

I HAVE the honour to submit, for the information of the Hon'ble the Lieutenant-Governor, a detailed Statement showing the work that has been carried on in the Gardens of the North-Western Provinces, including the Saharunpore, Chundwallah, Mussoorie, Chejouri, and Hawulbaugh Gardens, during the last year, or from 1st April, 1870, to 31st March, 1871.

2. During the year 35,649 fruit trees, 74,766 timber trees and flowering shrubs, and 2,939 parcels of seeds have been distributed to public and private institutions, and to the various Public Departments of the State, including the Civil, Military, Canal, Customs, Forest, Police, Public Works, Stud, and Railway Departments.

3. To the Canal Department alone the large quantity of 5,960lbs. or upwards of 2 tons of timber seeds have been supplied, and to soldiers' gardens the large number of 699 parcels of seeds have been issued. The public generally, too, have been supplied with seeds and plants on a large scale, and of the former 216 parcels.

4. To Doctor Forbes Watson, Inspector of Vegetable Products of India, 74 large parcels of seeds, &c., have been forwarded for distribution to public institutions and private parties in Europe.

5. To the Medical Department, through the Chief Medical Store-keepers, Calcutta, Madras, Allahabad, and Sealkote, large supplies of drugs have been forwarded including:—

	lbs.	oz.
Extract of Hyoscyamus, ...	248	4
Dried leaves of ditto, ...	428	1
Atees tubers, ...	940	0
Kamillah powder *(Rottleria tinctoria)*, ...	41	8

6. To different parties, to enable them to test machinery for preparing and cleaning the fibre of rhea—a fibre which is destined to take a prominent place among the exports of this country—upwards of 11 cwts. of dried stems have been forwarded. To meet the demands for dried and green stems of rhea, upwards of forty acres of land have been prepared, and are now being planted, from which a large crop of stems will shortly be procured, cut, dried, and forwarded to Europe, and to applicants in this country.

7. Several agricultural experiments have been carried on, some of which I may notice.

8. *Carolina Paddy.*—This rice has been grown on a small scale; 3lbs. were sown in a small plot of land in June last, and transplanted on to a kutcha beegah of land, and was cut down in October. The outturn was 471lbs. or about 6 maunds, equal to a yield of about 30 maunds per acre. An adjoining native farmer, Koer Singh, obtained 32 maunds per acre. The straw was about 5 feet in height and most luxuriant.

9. *Cotton.*—Several kinds of cotton were experimented on, *viz.*, New Orleans, upland Georgian, Tree Cotton, Nankin, and Hinghunghât. These were grown chiefly to meet the demands for seed, and at the same time in compliance with the orders of Government. To each kind an acre of land was allotted, in order that the yield might be ascertained.

But the land being urgently required for rhea, the plants were ploughed up before a half of the crop of the season could be gathered. The quantity of uncleaned cotton gathered was 641lbs. The experiments will again be resumed this season.

10. *The Rhea cultivation.*—The cultivation of the rhea is now being carried on with the utmost vigour, and, as stated, there are now about forty acres of land prepared, and being planted. Some of the land selected for the cultivation adjoining the garden having been proved to be unfitted for the purpose, the plants have been removed to a division of the garden, where they are now growing vigorously. The rhea is a gross feeding plant, and requires rich or well-manured land. To assist in carrying on the cultivation, Colonel Sir C. Doyly, Officiating Superintendent of Studs, North-Western Provinces, has kindly placed at my disposal upwards of a thousand loads of manure which have greatly aided our operations, and as but little manure was available elsewhere I was placed under still greater obligations, as without it I could with difficulty have carried out the orders of Government regarding the rhea. To Colonel Irwin, Superintendent of Stud, Saharunpore, I am also under great obligations for carrying out in a liberal manner the orders of the Director of Studs.

11. *Fodder grasses.*—Considerable attention has been paid to good fodder grasses, and large quantity of seeds distributed. By Dr. Forbes Watson, in conformity with instructions of Her Majesty's Secretary of State for India, 24 parcels of grass seeds were forwarded to the gardens, consisting of the following kinds :—Italian rye grass, perennial rye grass, cow grass, Italian crimson clover, all of which have been extensively grown, and seeds distributed. Several of these, particularly the crimson Italian clover, and the cow grass, appear to be well-suited to the North-Western Provinces.

12. *Silk cultivation.*—Large plantations of mulberry trees, particularly of the Morus Chinensis and Morus Multicaulis,

have been formed in the Saharunpore Gardens and at Chundwallah in the Deyrah Dhoon, to meet any demands that may be formed by parties desirous to undertake the cultivation. The seed forwarded by the Bengal Government were useless, and gave no results. As His Honor the Lieutenant-Governor has referred the matter to His Excellency the Governor-General in Council, it is unnecessary for me to allude further to the subject than state that Captain Murray, Assistant Conservator of Forests, Deyrah Dhoon, has a large quantity of "seed" at his disposal.

13. *Cinchona cultivation.*—Tea cultivation having now been brought to a close at Ayartoli in Kumaon, and there being a fine tract of land there available, Mr. Luce, Assistant Superintendent, Cinchona Cultivation, was deputed to proceed there with a number of Cinchona plants, which were progressing in a very unsatisfactory manner at Chundwallah in the Deyrah Dhoon. Of the locality, Mr. Luce has a high opinion. A large number of Cinchona seeds have germinated, particularly species of Cinchona Succirubra, Cinchona Officinalis, Cinchona Meerantha, Cinchona Pahudeana. To assist Mr. Luce, two natives brought up in the Cinchona plantations, Darjeeling, have been imported. Three large hot-beds for propagating plants have been built, and the work generally is progressing in a satisfactory manner. If the plants succeed well here, there will be a tract of upwards of two thousand acres of land available for the cultivation. But the progress made is limited, and up to date all the plants have been protected by glass. During the rains, a number of plants will be planted out by Mr. Clarke, Officiating Superintendent, Botanical Gardens, Calcutta, and Mr. Gammie, in charge of the Cinchona plantations, Darjeeling. Large supplies of different species of Cinchona seed have been forwarded.

14. *Timber trees and flowering shrubs.*—By Doctor Forbes Watson three tin cases filled with timber trees and flowering shrubs, and hermetically sealed, were forwarded from the India Office per pattern post. Many of the plants were

in excellent order, and are now in a most thriving condition. This mode of transmitting plants is highly novel, and well worthy of being tried on an extensive scale with the finer kinds of flowering shrubs. But the cases ought to be forwarded from England in December or January, and not later, and the stems of the young plants ought not to be less than $\frac{2}{8}$-ths. of an inch in diameter. Leaden numbers ought to be attached to the plants to correspond with the numbers on the invoices. In the cases there were parchment labels, but most of them were destroyed by the moisture and heat.

15. *Cork bark oak.*—This (*Quercus Tuber*) tree, which is thriving at Chundwallah and Mussoorie, was raised from seed sent from Spain by orders of Dr. Forbes Watson. The plants are in a thriving condition.

16. *Spanish chesnut* (*Castanea Vesca*).—Six large parcels of seeds have been received from the India Office, and from them large number of plants raised and distributed over the country. The nuts are now met with in the bazars of Deyrah and Mussoorie, and the tree is destined to be a valuable addition to the timber trees of the Dhoons and lower Himalayas.

17. By Messrs. Lawson and Sons, a valuable collection of timber seeds has been presented.

18. Colonel Ramsay, C.B., Commissioner of Kumaon, has, by orders of Government, forwarded four parcels of gum tree seeds, *Eucalyptus*, which have germinated most freely.

19. By the Curator of the Government Garden, Bombay, a valuable collection of plants were presented, including some fine Caladiums, &c.

20. By Doctor Forbes Watson, considerable supplies of vegetable seeds have been forwarded from the India Office, but I regret to state that they arrived too late to be of much use for the season's sowing in the plains.

21. From Calcutta, a supply by purchase of American seeds have been received.

22. I beg, however, to notice prominently the magnificent collection of implements and machinery forwarded by orders of His Grace Her Majesty's Secretary of State for India

for the use of the Gardens and Museum. The machines and implements selected by General Cotton and Doctor Forbes Watson are admirably adapted for this country. On the farm belonging to the Stud and in the Gardens, several of the machines, as the reaping horse-rake, harrow, corn-crusher, winnowing and mowing machines, have been tested, and the results highly satisfactory. Full details showing the results, will form the subject of another communication. In communication with the Officiating Commissioner, Mr. Lind, and Officiating Collector, Mr. Jenkinson, arrangements are about to be made to have several field days in order that the native community interested in agricultural progress may see the advantages to be derived from the employment of machinery and good implements. Already several private trials have taken place attended with most interesting results. On the Stud farm a field of oats of upwards of twelve beegahs was cut by one of the reaping machines in an hour; a crowd of natives watched the action of the machine, and, when the work was finished, asked what work was to be assigned to them, as the machine had done it all. Here and there some straws were left scattered over the field. In a few minutes, the horse-rake collected them into a heap, nor were the results with the corn-crusher and winnowing machines less gratifying. Four men working the corn machine, crushed three maunds of Indian corn in an hour, and one and a half maunds of barley.

23. From the Gardens a number of skilled workmen have been sent to public departments and private parties. To the Canal Plantations alone 14 native foresters and chowdhries have been forwarded, thus draining Saharunpore of its skilled working gardeners.

24. *Donations to the Museum.*—Several interesting collections of woods have been presented, and the general collection much enlarged; by the Curator of the Calcutta Garden, Herbarium, a valuable collection of upwards of ten thousand plants from Assam, &c., has been presented.

25. By the Public Works Department, six cases for speci-

mens have been placed in the Museum, all of which have been filled.

26. *Improvements in the Gardens.*—A large potting-house has been finished. To enable the new land taken up for rhea to be irrigated, seven water-courses and two culverts have been built. In the Mussoorie Garden the green-house is progressing, and will be finished before the rains set in. In the Chundwallah nursery, five hotbeds, sixty feet in length by four feet in breadth, a small green-house, and a tank to retain water have been built.

27. *Garden Library.*—Several volumes have been presented by Government, and volumes urgently required have been purchased.

28. In conclusion, I have great satisfaction in bringing to the notice of His Honor the Lieutenant-Governor the Head Gardener, Mr. Nelson, who has conducted the duties entrusted to his charge with energy and activity. The head Native Chowdhry Nanuck, and the under Chowdhry Shunkur, have ably and efficiently carried on their work; and the office and seed issue Department have been efficiently conducted by Baboos Nahur Singh, Ramji Dass, and Heera Lall, and the Museum has been carefully superintended by the Native Curator, and Herbarium, Kearah Singh, whose activity and energy are worthy of commendation.

[No. II.] *From* C. A. ELLIOTT, ESQ., *Officiating Secretary to Government, North-Western Provinces, to* W. JAMESON, ESQ., *Superintendent of Botanical Gardens (No.* 991*A).—Dated Nynee Tal, the* 19*th June,* 1871.

I AM directed to acknowledge receipt of your letter No. 393, dated the 20th April, and enclosures, being the Annual Report on Government Gardens in the North-Western Provinces for 1870-71, and in reply to communicate the following remarks.

2. The distribution of fruit trees, timber trees, flowering shrubs, and seeds, as given in the margin, shows an increase under the two latter heads, and testifies to fulfilment by the garden of the chief purpose for which it was established.

	1869-70.	1870-71.
Fruit trees,	41,833	35,649
Timber ditto	6,871	74,766
Flowering shrubs		
Parcels of seeds	1,483	2,939

3. *Para.* 5.—Another great benefit conferred by the gardens on the country is the supply of useful country medicines to the Medical Department. The distribution of these drugs, as shown in the margin, continues at a steady rate, and is noticed by the Lieutenant-Governor with satisfaction.

	1870-71.		1869-70.	
	lbs.	oz.	lbs.	oz.
Extract of Hyoscyamus, ...	248	4	101	3
Dried leaves of Hyoscyamus,	428	0	199	8
Atees Tubers ..	940	0	957	0
Kamillah powder,	41	8	70	0

4. *Para.* 8.—The success obtained in the experimental cultivation of Carolina Paddy was considerable, though the area on which the seed was tried was too small to make the test complete. The experiments with the various descriptions of cotton mentioned in your 9th paragraph had to be curtailed owing to the land being required for rhea cultivation, but His Honor hopes that during the present year they may be carried out without interruption.

5. *Para.* 10.—The cultivation of the rhea plant has been very successful, and your operations appear to the Lieutenant-Governor fully to meet the object contemplated by His Excellency the Governor-General in Council.

6. Very little progress has as yet been made in the growth of Cinchona at Ayartoli, and none of the plants are yet strong enough to dispense with the protection of glass. The Lieutenant-Governor looks with much solicitude to the result of these Cinchona experiments, and will be glad to receive more frequent reports (which may, if you prefer it, be rendered demi-officially) of Mr. Luce's proceedings.

7. *Para.* 14.—The success of the mode adopted by Dr. Forbes Watson of transmitting timber trees and flowering

shrubs to India in hermetically-sealed cases is interesting, and your remarks on the subject will be communicated to the Supreme Government with a view to your recommendations being submitted to the India Office, and the method being tried on a more extensive scale.

8. *Para.* 16.—The Spanish chesnut, which has been cultivated with great success, seems congenial to the country, and will, it is hoped, prove useful as an article of food.

9. The result of the experiments with the machinery forwarded by the Secretary of State is highly satisfactory, and His Honor awaits with interest the further report promised in the 22nd paragraph of your letter. Your proposed plan of having fixed days on which the working of the machines may be exhibited to the agriculturists of the neighbourhood, is approved.

10. It is observed that no mention is made this year of the success of the new potato seed obtained from England and sent to the Mussoorie Gardens, or of the effects of the chemical manure forwarded by Government for trial, as noticed in the 20th and 28th paragraphs of the Report for 1869–70. These should be adverted to in next year's Report.

11. The Ayartoli Garden has hitherto been considered one of the Government Tea Plantations, and you still continue to show its expenditure in the Report on those plantations. As, however, it has now ceased to grow tea, and is devoted to Cinchona, it should be transferred with its budget provision, and included among the dependencies of the Saharunpore Government Garden.

12. The receipts from the sale of fruit and plants have fallen off. They were Rs. 2,581-4-0 against Rs. 3,954-0-11 in 1869-70.

13. The expenditure of the year compared with that for 1869-70 was as follows :—

	1870–71.				1869–70		
Saharunpore Garden ...	Rs. 8,835	12	10	... Rs.	8,760	0	0
Mussoorie ditto ...	,, 792	0	0	... ,,	792	0	0
Hawulbaugh ditto ...	,, 600	0	0	... ,,	600	0	0
Contingencies ...	,, 3,500	0	0	... ,,	3,498	9	4
Total, Rs.	13,727	12	10	... Rs.	13,650	9	4

14. This expenditure, however, is only that of the budget allotment. The entire sum of Rs. 2,581-4-0, realized by the sale of plants and seeds, was also laid out on miscellaneous charges connected with the maintenance of the gardens. There is no real distinction in the expenditure in these two accounts, and I am to request that in future all receipts and disbursements may be shown in one statement. On the one side should be shown the Budget allotment, together wtih the receipts from sales; on the other, the whole expenditure at each of the Gardens in full detail as at present.

Art. II.

BOOKS SUBMITTED BY NATIVE WRITERS.

[No I.] MEMORANDUM *No.* 80 *of* 1871-72, *by Officiating Director of Public Instruction, North-Western Provinces, on an Urdu Prose Manuscript of* 174 *pages octavo, entitled* "TARKIB-I-ZAHIR," *by* SYUD IMAM-OOD-DEEN, *Private Teacher of Mathematics, Muttra, dated* 16*th August*, 1871.

SOME slight interest attaches to this book as being an epitome of the instruction imparted by an ordinary private tutor or teacher of an indigenous school to the children committed to his charge. The highest object of the book and its compiler appears to be to teach a pupil sufficient of the Kayath's art to enable him to earn a few rupees as a *Mohurrir*. The book begins with a rough Persian Grammar consisting of a great number of paradigms of verbs, with a few introductory rules. There is no attempt to explain inflectional or conjugational processes, or to point out to the learner the principles of their formation. Almost every page displays a very imperfect and inaccurate acquaintance with grammar, and the definitions are singularly uncouth where they are not absolutely incorrect. The writer regards the *masdar* and the *ism-i-mutasarrif* as synonymous; he defines *maf'úl* as the action done (*jo kam ho jàe usko maf''úl kahte hain*); and says that the second person imperative cannot be passive, because "*hukm shakhs hazir f'il yane kam ko majhúl nahin kar sakta.*" I am afraid I hardly understand what he means, but the reason alleged looks very much like nonsense.

After passing through the grammar the student receives instructions in letter-writing. He has first set before him several pages of the Persian words which most constantly occur in letters and petitions, and then a number of letters on ordinary subjects in the Persian language are given him for imitation. The concluding portion of the book consists of a Persian and Urdu vocabulary containing classified lists of more or less useful words.

This, then, appears to be the *quadrivium* of an indigenous shcool—(1) a smattering of Persian grammar ; (2) writing ; (3) the composition of Persian letters ; (4) learning by heart a number of Arabic and Persian words. And this course is popular, and will still be popular with many, because a boy who has graduated in it can manage to earn a pittance by the mechanical labour of his pen. The compiler thinks that his book should be used in Government schools. I do not agree with him, nor do I think it suitable for reward.

[No. II.] *Letter from Officiating Junior Secretary to Government, North-Western Provinces, to Officiating Director of Public Instruction, North-Western Provinces (No. 3772A.).—Dated Nynee Tal, the 23rd August,* 1871.

I AM directed to acknowledge receipt of your docket No. 1196, dated 16th August, with which you submit a memorandum of your opinion of an Urdu manuscript work entitled "Tarkib-i-Zahir," by Syud Imam-ood-deen, Private Mathematical Teacher, Muttra.

2. In reply, I am to state that His Honor the Lieutenant-Governor concurs in your opinion that the work is not suitable for reward, and it is accordingly returned for transmission to the author with that intimation.

3. His Honor considers your review instructive and significant of the jejune and profitless nature of a really indigenous curriculum, and as such has been pleased to direct publication with the reports of successful compositions in the *Selections from the Records of Government.*

[No. III.] MEMORANDUM *No.* 74 *of* 1871-72, *by Officiating Director of Public Instruction on an Urdu Prose Manuscript of 366 pages octavo, entitled* KHULASATUL-'ULUM : *by Munshi Shafakatu'llah, Second English Teacher, Mission City School, Bareilly.*

THIS is a translation, with frequent transliterations, of Chambers's Introduction to the Sciences, a well-known elementary work on Astronomy, Natural Philosophy, Geology,

and Physical Geography, Meteorology, Electricity, and Magnetism, Chemistry, Botany, Zoology, Human Physiol, and Mental Philosophy. The original treatise is well adapted for the study of an intelligent Scotch or English boy, to whom many of the scientific terms, the instruments, and other objects—the towns and places, the trees, shrubs, and flowers, the beasts, birds, and fishes—are to some extent familiar, at least by name, and who, when he encounters a difficulty, may refer to his teacher or a friend for assistance. But if the book were translated into French, or Italian, or German, and the technical terms left in their original English, without corresponding equivalents, or at least an attempt at explanation, the Gallic, Italian, and Teutonic youth would be most sorely puzzled. An Indian boy unacquainted with English would, under somewhat similar, but far less favourable, circumstances, find the book in numerous passages darker than the darkest oracle. Almost the whole ground which the work covers is *terra incognita* to him, and if he is to enter it, his way should be made as clear as possible. To him a mere translation, however well executed, of an English scientific work must be nearly unintelligible. What is wanted is a simple book written expressly for Indian boys; written by a man who knows the language in which he writes and the language of the books which guide him; written by a man who not only knows the subjects which he treats, but knows them as connected with India. Some knowledge of Indian Geology, for instance, and some degree of familiarity with the flora and fauna of the country, are absolutely indispensable.

Boys in our higher schools and colleges, when they study Geology, will study it from English books and under English teachers, and they will of course have to become acquainted with the English terminology. But I cannot conceive the use, at present, of teaching the Hulkabundi child, as the translation before me does, that the Silurian system is so called from "a man named Siluri, who lived in the times of the Romans;" to puzzle his head with *kanglamarit* (conglomerate), *rufing islet* (roofing-slate), *felspar*, *harnblend*,

and *grenot iston*, and to refer him for further information regarding the latter to Waterloo Bridge, the statue (*tasvir*) of Memnon, and Pompey's Pillar. Greywacke, I observe, is translated, but somewhat more loosely than scientific accuracy requires. I do not think that any Native would make much out of the chapter on Geology. I am sure I could not have understood it without the aid of the original.

Similarly with regard to Zoology. It is not thought necessary to introduce the English child to the *tapasi machhli* or the *rohu*; why, then, should the "poor Indian" have his "untutored mind" distracted by the *karp, paik, ketfish, trát* (trout), *sáman, kád*, and *hedak*? The Munshi does sometimes attempt to translate the names of animals, but he is not always successful. The Bird of Paradise he calls *Simurgh*.

There are many errors in the work which I have not thought it necessary to point out. My chief objection is to the principle of literal translation of scientific works instead of adaptation. The preparation of a book which shall be to Indian boys what Chambers's Introduction is to English boys requires very considerable attainments and special qualifications. Parts of the book might be useful if carefully corrected and revised, and might form a second part to the *Hakaik-ul-Maujudát*. But the writer should eschew Geology, Chemistry, Botany, and Zoology till he is practically acquainted with those subjects.

I do not think that the book in its present shape deserves consideration.

[No. IV.] *Letter from Officiating Secretary to the Government, to Officiating Director of Public Instruction, North-Western Provinces, dated Nynee Tal, the 19th August*, 1871.

I AM directed to acknowledge the receipt of your Docket No. 1096, dated the 9th August last with which you submit a Memorandum containing your opinion on the work entitled "Khulasatul 'Ulum" by Munshi Shafakutul'lah, Second English Teacher, Mission City School, Bareilly.

2. In reply I am desired to say that the Lieutenant-Go-

vernor concurs with you in thinking that the work as it at present stands is not deserving of consideration.

3. The principles you lay down are so sound and so well illustrated by the work under review, that your report will be published in the Selections from the Records of this Government as indicating what kind of translations are likely to prove useful and what the reverse.

Art. III.

WARDS' INSTITUTION, BENARES.

[No. 1.] *From* A. COLVIN, ESQ., *Secretary, Board of Revenue, to* C. A. ELLIOTT, ESQ., *Officiating Secretary to Government, North-Western Provinces* (*No.* 640).—*Dated Allahabad, the* 12*th July*, 1871.

IN submitting, for the information and orders of His Honor the Lieutenant-Governor, the accompanying letter No. 302A., dated 9th ultimo, from the Commissioner of the Benares Division, giving cover to the Annual Report and Statements of the Wards' Institution at Benares for the year 1870-71, I am directed to state that the Board consider the results of the year's management to be, on the whole, satisfactory.

2. The percentages of absence from the Institution have been higher than during the previous year. Frequent absence is much to be regretted as tending to make the wards forget much they may have learnt, and to expose them to unsalutary influences. The Board are of opinion that leave of absence, except under special circumstances, should be limited only to the College vacations.

3. The Board concur in the remark by the Joint Visitor, that, considering that out of 24 wards in the Institution, 15 of the wards are from Bengal, copies of the Report of the Wards' Institution should be forwarded to the Board of Revenue, Lower Provinces.

4. I am to notice that the Rajah of Barah recently, in an interview with the Officiating Junior Member, expressed his regret that, under the present existing rules of the Institution, he was compelled to withdraw his three sons.

5. The Junior Member pointed out to him that he might conveniently hire a house for them at Benares, and they could still continue their College career. The Rajah did not seem to think that this could be done, but evinced much regret that his sons' studies should thus come abruptly to a close.

6. The Board would adopt Commissioner's suggestion, and divide the establishment into Senior and Junior Depart-

ments; and meanwhile, as a special case, they consider that the two young Barah lads might be allowed to continue their career at the Institution, whilst the eldest lad, now the father of a family, should be desired to leave.

7. The Board advocate the suggestion of the Officiating Visitor to print and publish the Annual Report of the Wards' Institution.

8. Adverting to paragraph 7 of the Commissioner's letter, the Board will request the Commissioner to invite the attention of the Superintendent to the dirty condition of the building in which the wards live, and to inform him that he will be held individually responsible for keeping the rooms clean and tidy.

9. With regard to paragraph 8, I am to remark that the Commissioner has done well in insisting on the more regular submission of monthly accounts, and in the introduction of a better system in their preparation.

10. In conclusion, I am desired to bring to the special notice of His Honor the Lieutenant-Governor the success of the young Rajah Sheoraj Nundun Singh of Sheohar, in gaining, after competition, the first prize in his class in the Benares College.

[No. II.] *From* W. A. FORBES, ESQ., *Officiating Commissioner, Benares Division, to* A. COLVIN, ESQ., *Secretary, Board of Revenue, North-Western Provinces* (*No.* 302*A*). —*Dated Benares, the 9th June*, 1871.

I HAVE the honour to submit the Report on the Benares Wards' Institution for the past year 1870-71.

2. The Report itself, and its accompanying Statements (which I have marked A., B., C.,) were prepared by the Superintendent of the Institution, and it is accompanied by a memorandum written by Baboo Shiva Prasad, C.S.I., Inspector of Education, and a forwarding letter from the Officiating Principal of the Benares College, who is *ex-officio* the Visitor.

3. The number of boys at the commencement of the year was 23, and at the close 24, and I do not think there is any probability of any increase of numbers during the current

year. We know of three going, the sons of the Barah Rajah, resident in Allahabad, and of one coming, the minor Rajah of Kuntit in Mirzapore.

4. One of the points noticed in the Report, and by the Inspector of Education, who is Joint Visitor, is the length of absence during holidays, &c. Leave is not given except on the application of the Collectors in whose Districts the wards live, supported by their Commissioner. As stated on a former occasion, I am in favour of allowing regular holidays, as tending to make the Institution more popular with the parents of the wards, who naturally desire now and again to see their children.

At my request the Superintendent of the Institution has furnished a return which is marked D., giving in detail reasons for the lengthened absences complained of.

5. The Joint Visitor writes that he has fought in vain to extend the period of minority from 18 to 21 years. I would particularly call attention to the remarks made by the Visitor, Mr. Wright, on this subject in his forwarding letter of the 26th ultimo. In all that he says I most cordially agree. Our Institution is no place for children of six years of age (*vide* Superintendent's paragraph 2) and young men of 21, some of them with children at home. Should Mr. Wright's suggestion that the elder wards should complete their studies at the proposed Allahabad College not be listened to, I am most strongly of opinion that the boys of tender age should be completely separated from the others, and that thus there should be a Junior and Senior Department. The proposed extension of the Wards' Institution buildings would enable us to carry such a measure out.

6. During the year, when I have had the leisure, I have endeavoured to supply what I consider the great want in the Institution, and have joined and led the lads in their sports. In this I was always aided whilst he was there by Mr. Chester Macnaghten, tutor to the young Durbhungah Rajah and his brother and cousins, now residing at Benares and attending the College classes. The boys require to be led and encou-

raged in their games. They are listless and apathetic without such leading.

7. I have more than once had to find fault with the dirty condition of the building in which the wards live, and the untidy appearance of the rooms in which they sleep, which appear to be used as drying grounds for damp linen.

8. The monthly accounts have not been submitted with regularity, and this, I have lately insisted, shall be altered in the future. Regarding other irregularities in the system of account-keeping and expenditure I have also noted points to be rectified.

[No. III.] *From* W. H. WRIGHT, ESQ., *Officiating Visitor, Wards' Institution, to* W. A. FORBES, ESQ., *Officiating Commissioner, Benares.—Dated Benares, the 6th May,* 1871.

I HAVE the honor to forward the Annual Report of the Superintendent, Ward's Institute, Benares, for the official year 1870-71, together with a memorandum thereon written by Baboo Shiva Prasad, C.S.I., the Joint Visitor.

2. You will be glad to observe from the Report that the Institution is in a flourishing condition, and appears to answer the purposes intended by the Government, North-Western Provinces.

3. With regard to Baboo Shiva Prasad's memorandum, I agree in the main with his remarks, especially as concerning the leave of absence granted to the wards.

4. I also think the Annual Reports of the Institution might be printed, and circulated with advantage.

5. I cannot, however, endorse Baboo Shiva Prasad's views with regard to the advisability of wards remaining in the Institute after they have come of age. I think such pupils are quite out of place in a Wards' Institute, as they are no longer wards at all, but responsible young men. The independence of character and behaviour expected from such pupils is quite incompatible with the subordination required from young lads, and the diverse interests must clash in the Wards' Institute as at present conducted.

6. It is undoubtedly extremely desirable that young Rajahs should continue their studies to the B.A. and M.A. stand-

ards—a thing hardly as yet attempted in the North-Western Provinces; but the Wards' Institute is scarcely the place to carry this out.

7. It is deeply to be deplored that higher education has only as yet reached the higher classes of natives as a subject of showy but vague talk, or as a means of ingratiating themselves with Government by the gift of large sums of money for educational purposes. If the Rajahs are sincere, they should show their sincerity by giving their sons and relations a complete education, and not taking them away to the demoralisation of their homes as soon as they have attained a smattering of English. Even if they be able to speak English fluently, they have in no way attained education. Their education should then commence, and their minds should be developed and their characters strengthened by a judicious course of study. Such a course would be the M.A. degree of the Calcutta University.

8. It is only by real education that the young Rajahs can be trained to take their proper place among their countrymen, *viz.*, as statesmen and leaders of thought. To ensure this, something very different from the present Wards' Institute is required.

9. I observe with the greatest pleasure that Rajah Sheoraj Nundun Singh of Sheohar, a pupil of the Wards' Institute, gained, after competition, the first prize in his class in the Benares College. Such a boy as this, if properly looked after and kept to his work, would undoubtedly take honors at the University, and become, by his education and position, a leading man among his countrymen. It is equally certain, however, that in a short time he will be removed from the Institute, will discontinue his education, and will be lost among the mass of uneducated Rajahs.

10. If the Government of the North-Western Provinces consider it a desirable object to attempt some scheme for training young Rajahs who have come of age up to the proper standard of education, the opening of the new University at Allahabad will be a splendid opportunity for making the attempt.

[No. IV.] MEMORANDUM *by* BABOO SHIVA PRASAD, C.S.I., *Joint Visitor Wards' Institute.—Dated Benares, the 19th May*, 1870.

(REMARKS ON THE REPORT OF THE SUPERINTENDENT.)

IN looking over the Report (1870-71), it strikes me that out of 24 boys, 15 should be from the Lower Provinces. But Oudh has now its own Institution, and Rajputana will soon have one of its own. In the North-Western Provinces, so few Talookdars (lords of large estates) have been left, that the permanently-settled Lower Provinces must always remain our main feeders; and, if so, copies of our Reports, if the Government permit, may be sent with advantage to their Board of Revenue, whose opinion will always be most valuable to us, and whose advice will no doubt do us a great deal of good. The energetic Commissioner of Patna, Mr. Jenkins, has already seen the Institution with His Excellency the Viceroy; Colonel Haughton, of Kooch Behar, and the Managers of the Kanhauli and Seohur estates have also been here. As far as our North-Western Provinces are concerned, the Institution had the honor this year of a close inspection from the Lieutenant-Governor, the Hon'ble Sir W. Muir, K.C.S.I., and Mr. Reid, the Senior Member of the Board of Revenue.

Four of the wards left the Institution before the expiration of their minority. I have fought in vain to extend the period of minority from 18 to 21 years. The Government, after some correspondence, thought it better to wait till the result of discussions in the Bengal Council was known. There also this question was mooted, but I do not know why they have dropped it. Is it not possible to give them a year or so to prepare themselves for taking into their hands the management of their estates *after* instead of *before* attaining their majority?

I am sorry to find the percentages of absence is higher in the year under review than in the preceding. Honorable exception is to be made in favor of the two Barah boys—Lal Lakshman Singh, and Lal Bharat Singh. I am quite against long leave, given only because the College is closed. The Government wards are not like common boarders, who are

looked after and taken care of by their fathers and guardians when they go home to enjoy their holidays. The wards having no father or any responsible guardian at home, generally fall into the hands of their servants and female relatives, and the bad habits of a month's sojourn out of the Institution neutralize its wholesome influence for months and months to come. In fact, the wards' home is the Wards' Institution, and I do not think they grant so much leave in the Calcutta Wards' Institution.

The Commissioner, Mr. Forbes, not only takes a most lively interest in the wards, but has become their best playmate.

Mrs. Etherington's experimental appointment as a teacher for drawing and music promises well. The boys will not derive only much advantage from these branches of study, but all the advantages which the society of an English lady is calculated to confer. Her salary, Rs. 100 per mensem, is for the present defrayed from personal charges.

The Superintendent says—"It is true they misbehave occasionally;" and they will, if they are true to the nature of boys. However, it is most creditable to the Superintendent that "the general conduct of the wards has been, upon the whole, satisfactory." Benares is not behind the other parts of the country in the infamous trade of writing anonymous letters, and busy people have not spared the Superintendent and the wards the annoyance of their ebulitions; but the authorities are too awake to be misled by such wretches. The post of Superintendent is of peculiar importance and responsibility; and the whole success, if there has been any, must be attributed to the support and confidence which the Superintendent has all along enjoyed and enjoyed deservedly from his superiors. The question of a European Superintendent has often been mooted, but as often laid aside. The Wards' Institution is nothing more than a superior boarding-house attached to the College, and the control over it of the Principal as Visitor, and the visits of the Commissioner who lives close by, have been found hitherto to work unimpeachably. The advantages of having a Brahmin Superintendent of the stamp and qualifications of Baboo Kedarnath Paludhi are too well known to be detailed here.

The mean average monthly general charges, Rs. 39-1-4, and individual charges, Rs. 63-14-3, or the total charges of Rs. 102-15-7 per boy, will be acknowledged by every one to be the lowest possible with which we can keep the Rajahs and Maharajahs in the Institution. The elder boys are encouraged to keep their own accounts and look after their own little household affairs; this promotes economy and prepares them to a certain extent for their future life.

One word more and I have done. Somehow or other, the three sons of the Barah Rajah, namely, Lal Ram Singh, Lal Lakshman Singh, and Lal Bharat Singh, have received a notion that the Government does not like their remaining longer in the Institution, and they are preparing to leave. This is most certainly deplorable, and I earnestly beseech the members of the Board of Revenue when they see the Rajah of Barah not only to explain to him how happy the Government will be by his sons prosecuting their studies, but kindly to encourage him in every way to keep his sons longer in the Institution. They are, perhaps, the first sons of a Rajah in the North-Western Provinces who are going up to the University examinations, and if even one of them succeeds in obtaining a degree here, he will make an excellent example for the whole North-Western Provinces. His Honor extolled Gangasaram, a boarder of the Agra College, in an Agra Durbar, for his success in the University examination. Let us have a boy of our Wards' Institution taken notice of for a similar reason in some Allahabad Durbar or convocation. The boys are well-behaved and of very good promise.

[No. V.] *From* BABOO KEDAR NATH PALUDHI, *Superintendent, Wards' Institution, Benares, to* W. H. WRIGHT, ESQ., *Officiating Visitor Wards' Institution, Benares.—Dated Benares, the* 16*th May*, 1871.

I HAVE the honour to submit the following brief report on the working of the Wards' Institution, Benares, for the year 1870-71.

2. I commenced the year under review with 23 wards and closed it with 24, *viz.*:—

1. Baboo Buddhi Nath, Choudhari of Dinajpore, Tirhoot.
2. Lal Ram Singh,
3. Lal Lakshman Singh, } of Barah, Allahabad.
4. Lal Bharat Singh,
5. Baboo Hari Har Datta,
6. Baboo Shankar Datta, } of Jounpore.
7. Thakoor Jugmohun Singh, of Vijay Raghogarh.
8. Rajah Udit Narayan Singh, of Tirwa.
9. Rajah Kumad Narayan, of Bijnee, Assam.
10. Rajah Nripendra Narayan,
11. Amrit Hari, } of Cooch-Behar.
12. Pankaj Hari,
13. Rajah Rampratap Sinha, of Manda, Allahabad.
14. Rajah Shewraj Nandan Singh, of Shewhur, Tirhoot.
15. Rajah Ranmast Singh, of Kuttra, Jhansie.
16. Baboo Sadhusaran Prasad, of Bagoura, Tirhoot.
17. Baboo Jamna Prasad,
18. Baboo Moti Prasad, } of Kanhauliy, Tirhoot.
19. Sarfaraz Hoosein Khan, of Patna.
20. Baboo Mahabeer Prasad,
21. Baboo Rajendra Prasad, } of Saran.
22. Baboo Kunta Prasad, of Kanhauliy, Tirhoot.
23. Baboo Rudraraj Nandan Singh, of Shewhur, Tirhoot.
24. Baboo Sitesh Chandra Sannyal, of Cooch-Behar.

The average number of wards in the Institution during the year is $24\frac{1}{4}$ against $22\frac{2}{3}$ of the preceding year. The ages of the wards range from 6 to 20 years, the youngest being Baboo Sitesh Chandra, of Cooch-Behar, and the eldest Lal Ram Singh of Barah.

3. *Admissions.*—There have been six admissions during the year. Baboos Mahabeer Prasad and Rajendra Prasad joined the Institution on the 1st of August; Baboo Kunta Prasad on the 15th of August; Baboo Krishna Gopal Narain

of Sunrsaron the 3rd of October; Baboo Rudraraj Nandan Singh on the 3rd of October; and Baboo Sitesh Chandra Sannyal on the 9th of December.

4. *Withdrawals.*—There have been five withdrawals during the year. The Rajah of Jagmanpore left the Institution on the 29th of September; the Rajah of Bhurey on the 1st of February; Baboo Devi Prasad on the 10th of February; Baboo Krishna Gopal Narain of Sunrsar on the 13th of February; and Kachhwa Kshitendra Narain, of Cooch-Behar, on the 16th of March. The Rajah of Jagmanpore, the Rajah of Bhurey, Baboo Devi Prasad, and Baboo Krishna Gopal Narain left the Institution some time before the expiration of their minority, to prepare themselves for taking into their hands the management of their estates on attaining their majority. Kachhwa Kshitendra Narain, a companion of the minor Rajah of Cooch-Behar, was removed from the Institution for misconduct.

5. *Absence.*—The absence of the wards during the year is as follows:—

1.	Baboo Buddhi Nath Choudhari,	46	days in	365.
2.	Lal Ram Singh, ...	78	,,	,,
3.	Lal Lakshman Singh ...	62	,,	,,
4.	Lal Bharat Singh ...	62	,,	,,
5.	Baboo Hari Har Datta ...	66	,,	,,
6.	Baboo Shankar Datta ...	66	,,	
7.	Thakoor Jagmohan Singh ...	37		
8.	Rajah of Tirwa ...	[illegible]	,,	,,
9.	Rajah of Bijnee		,,	,,
10.	Rajah of Cooch-Behar ...	30	,,	,,
11.	Amrit Hari ...	30	,,	,,
12.	Pankaj Hari ...	30	,,	,,
13.	Rajah of Manda ...	30	,,	,,
14.	Rajah of Shewhur ...	133	,,	,,
15.	Rajah of Kuttra ...	44	,,	,,
16.	Baboo Sadhusaran ...	194	,,	,,
17.	Baboo Jamna Prasad ...	32	,,	,,
18.	Baboo Moti Prasad ...	32	,,	,,

19.	Sarfaraz Hoosein Khan ...	34	days in	365.
20.	Baboo Mahabeer Prasad	31	,,	243.
21.	Baboo Rajendra Prasad ...	31	,,	,,
22.	Baboo Kunta Prasad ...	32	,,	229.
23.	Baboo Rudraraj Nandan Singh,	43	,,	181.
24.	Sitesh Chandra Sannyal		,,	,,

The percentages of absence during the past year and the preceding are as follows :—

	Names.		
1.	Baboo Buddhi Nath Choudhari ...	9·9	12·6
2.	Lal Ram Singh ...	19·5	24·4
3.	Lal Lakshman Singh ...	19·5	16·9
4.	Lal Bharat Singh ...	19·5	16·9
5.	Baboo Hari Har Datta ...	15·1	18·1
6.	Baboo Shankar Datta ...	15·1	18·1
7.	Thakoor Jagmohan Singh		10·1
8.	Rajah of Tirwa ...	12·6	32·6
9.	Rajah of Bijnee		...
10.	Rajah of Cooch-Behar ...	10·4	8·2
11.	Karzi Amrit Hari ...	10·4	8·2
12.	Karzi Pankaj Hari ...	10·4	8·2
13.	Rajah of Manda		8·2
14.	Rajah of Shewhur ...	25·5	36·4
15.	Rajah of Kuttra ...	10·7	12·1
16.	Baboo Sadhusaran ...	10·4	53·1
17.	Baboo Jamna Prasad ...	35·0	8·7
18.	Baboo Moti Prasad ...	35·0	8·7
19.	Sarfaraz Hoosein Khan	5·5	9·3
20.	Baboo Mahabeer Prasad		12·7
21.	Baboo Rajendra Prasad		12·7
22.	Baboo Kunta Prasad		13·9
23.	Baboo Rudraraj Nandan Singh		23·7
24.	Baboo Sitesh Chandra Sannyal		...

It will appear from the above that the percentages of absence have been higher in the last year than in the preceding, except in the cases of the Cooch-Behar and Kanhauliy wards.

6. *Health.*—The wards in general enjoyed, I am glad to observe, almost uninterrupted health. There were, however, a few cases of slight fever, cough, and chickenpox. But Baboo Sadhusaran Prasad of Bagoura has been very frequently sick, and has consequently made very little progress.

7. *Exercises and amusements.*—The wards have been regularly exercised in walking, running, jumping, riding, swimming, swinging, climbing, and gymnastics after the native fashion. In the choice of games, preference is always given to such as exercise the limbs and promote the enjoyment of fresh air—such as cricket, croquet, rounders, prisoners' base, &c. Occasionally the elderly boys amuse themselves with the game of chess. The Officiating Commissioner, who takes great interest in the wards, often joins them in play, and has taught them English games.

8. *Physical Improvement.*—The physical improvement of the wards has been, upon the whole, very satisfactory. All the wards, excepting three or four, are now stronger, lighter, and healthier than they were last year.

9. *Music and Drawing.*—A class for music and drawing has been lately opened, and nine of the wards attend it at present three times a week. Mrs. E. Etherington, the teacher, takes great interest in the boys; and it is hoped that they will derive much advantage from these branches of study. Some of the boys take a pleasure in music and drawing, but none of them has as yet made any great progress in them.

10. *General Conduct.*—The general conduct of the wards has been, upon the whole, satisfactory. It is true they misbehave occasionally; but it is gratifying to observe that their general conduct and character are gradually improving.

11. *Expenditure.*—The general charges during the year amount to Rs. 12,019-13-6, which is below the sanctioned amount Rs. 12,069-0-5 by Rs. 49-3-11.

The monthly average of general charges is Rs. 1,001-10-5½; the mean of average monthly general charges is Rs. 39-1-4; of individual charges, Rs. 63-14-3; of total charges Rs. 102-15-7.

A.

Statement of charges for the year 1870-71.

Number.	Names.	Period.	Shares of general charges.	General charges. Rs.	As.	P.	Individual charges. Rs.	As.	P.	Total charges. Rs.	As.	P.	Remarks.
1	Baboo Buddhi Nath ...	st April, 1870, to March, 1871 ...	3	670	7	7	1,143	0	1	1,813	7	8	
2	Lal Ram Singh ...	Ditto ..											
3	Lal Lakshman Singh ...	Ditto ..	3	670	7	7	2,421	1	4	3,091	8	11	
4	Lal Bharat Singh ...	Ditto ...											
5	Baboo Hari Har Datta ...	Ditto ...											
6	Baboo Shankar Datta ...	Ditto ...	2	446	15	5	1,387	8	4	1,834	7	9	
7	Thakoor Jagmohan Singh ...	Ditto ...	1	223	8	1	871	13	6	1,095	4	7	
8	Rajah of Tirwa ...	Ditto ...	4	893	15	4	892	8	2	1,786	7	6	
9	Rajah of Bijnee ...	Ditto ...	4	893	15	4	1,007	1	7	1,901	0	11	
10	Rajah of Cooch-Behar ...	Ditto ...											
11	Amrit Hari ...	Ditto ...	8	1,430	1	4	2,069	1	7	3,499	2	11	
12	Pankaj Hari ...	Ditto ...											
13	Baboo Sitesh Chandra ...	December, 187C, to March, 1871 ...											
14	Rajah of Manda ...	April, 1870, to ditto ..	4	893	15	4	776	0	1	1,669	15	5	
15	Rajah of Shewhur ...	Ditto ...	5	1,003	9	7	1,274	0	1	2,277	9	8	
16	Baboo Rudraraj Nandan Singh,	October, 1870, to March, 1871 ...											
17	Rajah of Kuttra ...	April, 1870, to March, 1871 ...	3	514	1	11	740	3	3	1,254	5	2	
18	Baboo Sadhusaran ...	Ditto ...	3	670	7	7	769	7	7	1,439	15	2	
19	Baboo Jamna Prasad ...	Ditto ...											
20	Baboo Moti Prasad ...	Ditto ...	6	1,184	9	2	1,904	14	5	3,089	7	7	
21	Baboo Kunta Prasad ...	August, 1870, to March, 1871 ...											
22	Sarfaraz Hoosein ...	April, 1870, to March 1871 ...	2	446	15	5	708	12	1	1,155	11	6	
23	Baboo Mahabeer Prasad ...	August, 1870 to March, 1871 ...	2½	336	4	1	860	1	2	1,196	5	3	
24	Baboo Rajendra Prasad ..	Ditto ...											
		Total ...	50½	10,279	5	9	16,825	8	3	27,104	14	0	

B.

Statement of average monthly charges for the year 1870-71.

No.	Names.	Shares.	General charges.	Individual charges.	Total charges.
			Rs. As. P.	Rs. As. P.	Rs. As. P.
1	Baboo Buddhi Nath	3	55 13 11—7/12	95 4 0—1/12	151 1 11—2/3
2	Lal Ram Singh	3	55 13 11—7/12	201 12 1—1/3	257 10 0—11/12
3	Lal Lakshman Singh				
4	Lal Bharat Singh				
5	Baboo Hari Har Datta	2	37 3 11—5/12	115 10 0—1/3	152 13 11—3/4
6	Baboo Sankra Datta				
7	Thakoor Jagmohan Singh	1	18 10 0—1/12	72 10 4—1/2	91 4 4—7/12
8	Rajah of Tirwa	4	74 7 11—1/3	74 6 0—1/6	148 13 11—1/2
9	Rajah of Bijnee	4	74 7 11—1/3	83 14 9—7/12	158 6 8—11/12
10	Rajah of Cooch-Behar	8	143 0 1—3/5	212 9 5—2/5	355 9 7
11	Amrit Hari				
12	Pankaj Hari				
13	Baboo Sitesh Chandra				
14	Rajah of Manda	4	74 7 11—1/3	64 10 8—11/12	139 2 7—5/12

B.

Statement of average monthly charges for the year 1870-71.—(Concluded.)

No.	Names.	Shares.	General charges.	Individual charges.	Total charges.
			Rs. As. P.	Rs. As. P.	Rs. As. P.
15	Rajah of Shewhur	5	111 8 2-1	141 8 10-7	253 1 0-8
16	Baboo Rudraraj Nandan		-9	-9	-9
17	Rajah of Kuttra	3	42 13 5-1	61 10 11-4	104 8 5-5
18	Baboo Sadhusaran	3	55 13 11-12	64 1 11-12	119 15 11-6
19	Baboo Jamna Prasad	6	111 0 10-10	178 9 4-7	289 10 2-17
20	Baboo Moti Prasad		-32	-32	-32
21	Baboo Kunta Prasad		-5	-1	-1
22	Surfaraz Hoosein Khan	2	37 3 11-12	59 1 0-12	96 4 11-2
23	Baboo Mahabeer Prasad	2½	45 6 6-1	107 8 1-3	152 14 7-7
24	Baboo Rajindra Prasad		-8	-4	-8
			-527	-351	-29
	Total ...	50½	937 15 9-720	1,533 6 9-1,440	2,471 6 6-32
			-15,647	-13,211	-221
	Mean Charges ...	3	39 1 3-17,280	63 14 3-34,560	102 15 7-768

C.

Statement of Subjects of Study at the close of the year 1870-71.

No.	Names.	Age.	Date of Admission.	Class in Queen's College in 1869-70.	Class in Queen's College in 1870-71.	Subjects of Study.	Progress.	Remarks.
1	Baboo Buddhi Nath Choudhari of Dinajpoor.	14½	22nd October, 1864.	2nd Class, School Department.	2nd Class, School Department.	*English.*—Entrance Course for 1872. Marshman's History of India. Collier's History of England. Sree Nath Bose's Geography. Morell's Grammar and Analysis. *Mathematics.*—Arithmetic (whole). Algebra up to Problems. In Quadratic Equations. Euclid, four Books. *Sanscrit.*—Hitopdesh. Tatwa Kaumudi. *Hindi.*—Bhasha Tatwa Bodhni. Ramayana. *Urdu.*—Bara Jam Jahan Numa.	Good.	
2	Lal Ram Singh of Barah.	20	6th February, 1865.	2nd ditto,	2nd ditto,	*English.*—Same as above. *Mathematics.*—Ditto. *Arabic.*—Sallam-ul-adab. Nahomeer. *Persian.*—Muntakhabat Farsi, Part II. Qawaid-i-Farsi. *Hindi.*—Ramayana.	Do.	Did not pass the Annual Examination in consequence of bad health.

C.

Statement of Subjects of Study at the close of the year 1870-71.—(Continued.)

No.	Names.	Age.	Date of Admission.	Class in Queen's College in 1869-70.	Class in Queen's College in 1870-71.	Subjects of Study.	Progress.	Remarks.
3	Lal Lakshman Singh, of Barah.	19	6th February, 1865.	3rd Class, School Department.	2nd Class, School Department.	*English.*—Entrance Course for 1872. Marsliman's History of India. Collier's History of England. Sree Nath Bose's Geography. Morell's Grammar and Analysis. *Mathematics.*—Arithmetic (whole). Algebra up to Problems. In Quadratic Equations. Euclid, four Books. *Arabic.*—Sallam-ul-adab. Nahomeer. *Persian.*—Muntakhabat Farsi, Part II. Qawaid-i-Farsi. *Sanscrit.*—Saraswat. Hitopdesh.	Good.	
4	Lal Bharat Singh, of Barah.	17½	Ditto ...	2nd ditto ...	2nd ditto ...	*English.*—Same as above. *Mathematics.*—Ditto. *Arabic.*—Ditto. *Persian.*—Ditto. *Hindi.*—Ramayana.	Do.	
5	BabooHarihar Datta Dube, of Jounpore.	15	22nd June, 1865.	5th ditto ...	4th ditto ...	*English.*—Gleig's History of England. Howard's Grammar. Sree Nath Bose's Geography.	Tolerable.	

								Mathematics.—Arithmetic (Vulgar Fractions.) Euclid Book I., Prop. 20. *Arabic.*—Mizan Munshaib. *Persian.*—Muntakhabat Farsi, Part II. Qawaid-i-Farsi. *Sanscrit.*—Laghu Kaumudi.	
6	Thakoor Jagmohan Singh, of Bijai Raghogarh.	13½	19th March, 1866.	5th	ditto,	4th	ditto,	*English.*—Same as above. *Mathematics.*—Ditto. *Sanscrit.*—Hitopdesh. Tatwa Kaumudi. *Hindi.*—Ramayana. *Urdu.*—Dastur-ul-maash.	Fair.
7	Pankaj Hari of Cooch-Behar.	13	27th February, 1868.	6th	ditto,	5th	ditto,	*English.*—Reader, No. IV. Kempson's Poetry, No. I. History of Hindustan. Howard's Grammar. Sree Nath Bose's Geography. *Mathematics.*—Arithmetic, (Vul. Fractions.) *Sanscrit.*—Hitopdesh. *Hindi.*—Ramayana. Upakramanika. *Urdu.*—Haqaiq-ul-Maujudat. *Bengali.*—Paul and Virginia. Grammar.	Tolerable.
8	Rajah Udit Narain Singh, of Tirwa.	14	1st May, 1866,	7th	ditto,	6th	ditto,	*English.*—Reader, No. III. Howard's Grammar. Sree Nath Bose's Geography. *Arithmetic.*—Same as above. *Urdu.*—Qawaid-i-Urdu, Part IV. Muntakhabat-i-Urdu, Part III. *Hindi.*—Baran Mala.	Do.

C.

Statement of Subjects of Study at the close of the year 1870-71.—(Continued.)

No.	Names.	Age.	Date of Admission.	Class in Queen's College in 1869-70.	Class in Queen's College in 1870-71.	Subjects of Study.	Progress.	Remarks.
9	Rajah Kumad Narain, of Bijnee.	16	22nd June, 1867.	7th Class, School Department.	6th Class, School Department.	*English.*—Reader, No. III. Howard's Grammar. Sree Nath Bose's Geography. *Arithmetic.*—Afithmetic, (Vulgar Fractions.) *Sanscrit.*—Hitopdesh. *Hindi.*—Ramayana. Upakramanika. *Urdu.*—Jam Jahan Numa. *Bengali.*—Paul and Virginia. Grammar.	Fair.	
10	Amrit Hari, of Coooh-Behar.	14	7th February, 1868.	7th ditto ...	6th ditto ...	*English.*—Same as above. *Arithmetic.*—Ditto. *Sanscrit.*—Hitopdesh. *Hindi.*—Ramayana. Upakramanika. *Urdu.*—Haqaiq-ul-Maujudat. *Bengali.*—Paul and Virginia. Grammar.	Ditto.	
11	Rajah Rampratab Singh, of Manda.	10½	29th August, 1868.	7th ditto ...	6th ditto ...	*English.*—Same as above. *Arithmetic.*—Ditto. *Sanscrit.*—Ditto. *Hindi.*—Ditto. *Urdu.*—Ditto.	Very fair.	Received 1st prize in this Class.

12	Rajah Shivaraj Nandan Singh, of Shewhur.	15	1st July, 1868,	7th ditto,	6th ditto,	*English.*—Same as above. *Arithmetic.*—Ditto. *Urdu.*—Qawaid-i-Urdu, Part IV. Muntakhabat-i-Urdu, Part III. *Hindi.*—Bhugol Hastamalak.	Very good.	Did not go up to the Annual Examination in consequence of sickness.
13	Baboo Sadhusaran Prasad, of Bagoura.	17½	20th November, 1868.	7th ditto,	6th ditto,	*English.*—Same as above. *Arithmetic.*—Ditto. *Sanscrit.*—Ditto. *Hindi.*—Ditto. *Urdu.*—Tushrih-ul-Haruf.	Tolerable.	
14	Baboo Shankar Datta Dube, of Jounpore.	13	26th June, 1866.	7th ditto,	7th ditto,	*English.*—Reader, No. II. Howard's Grammar. *Arithmetic.*—Compound Division. *Hindi.*—Bidyankur. Itihas Timirnashak, Part II. Bhugol Hastamalak, Part II. *Urdu.*—Bagh-o-Bahar.	Meagre.	
15	Rajah Nripendra Narain, of Cooch-Behar.	8½	27th February, 1868.	8th ditto,	7th ditto,	*English.*—Same as above. *Arithmetic.*—Ditto. *Hindi.*—Ditto. *Urdu.*—Haqaiq-ul-Maujudat.	Tolerable.	
16	Rajah Ranmast Singh, of Kuttra.	14	29th August, 1868.	Not admitted in the College.	8th ditto,	*English.*—Reader, No. I. *Hindi.*—Itihas Timirnashak, Part I. Surajpore-ki-Kahani. Bhugol Hastamalak, Part I. *Urdu.*—Dastur-ul-maash. Qawaid-i-Urdu, Part II. *Arithmetic.*—Simple Multiplication.	Indifferent	

C.

Statement of Subjects of Study at the close of the year 1870-71.—(Concluded.)

No.	Names.	Age.	Date of Admission.	Class in Queen's College in 1869-70.	Class in Queen's College in 1870-71.	Subjects of Study.	Progress.	Remarks.
17	Baboo Jamna Prasad, of Kanhauliy.	15½	31st July, 1869.	Not admitted in the College.	8th Class, School Department.	*English.*—Reader, No. I. *Urdu.*—Ainah Tarikh Numa. Qawaid-i-Urdu, Part II. Jugraphia Alam, Part I. Dastur-ul-maash. *Hindi.*—Bidyankur. *Arithmetic.*—Compound Division.	Tolerable.	
18	Baboo Moti Prasad, of Kanhauliy.	12	Ditto ...	Ditto ...	8th ditto ...	*English.*—Same as above. *Arithmetic.*—Ditto. *Hindi.*—Itihas Timirnashak, Part I. Surajpore-ki-Kahani. Bhugol Hastamalak, Part I. *Urdu.*—Dastur-ul-maash. Qawaid-i-Urdu, Part II.	Indifferent.	
19	Sarfaraz Hoosein Khan, of Patna.	10	3rd December, 1869.	Ditto ...	8th ditto ...	*English.*—Reader, No. I. *Arithmetic.*—Compound Subtraction. *Urdu.*—Ainah Tarikh Numa. Qawaid i-Urdu, Part II. Jugraphia Alam, Part I. Dastur-ul-maash. *Hindi.*—Bhugol Hastamalak.	Very fair.	

20	Baboo Mahabeer Prasad, of Makhdoomgunj Saran.	16½	1st August, 1870.	Ditto ...	8th ditto ...	*English.*—Same as above. *Arithmetic.*—Simple Division. *Urdu.*—Same as above. *Hindi.*—Ditto.	Do.
21	Baboo Rajindra Prasad, of Makhdoomgunj Saran.	14½	Ditto ...	Ditto ...	8th ditto ...	*English.*—Reader, No. I. *Arithmetic.*—Simple Multiplication. *Hindi.*—Itihas Timirnashak, Part I. Surajpore-ki-Kahani. Bhugol Hastamalak. *Urdu.*—Dastur-ul-maash. Qawaid-i-Urdu, Part II.	Tolerable.
22	Baboo Rudraraj Nandan Singh, of Shewhur.	14	3rd October, 1870.	Ditto ...	8th ditto ...	*English.*—Same as above. *Arithmetic.*—Simple Division. *Urdu.*—Ainaa Tarikh Numa. Qawaid-i-Urdu, Part II. Jugraphia Alam, Part I. Dastur-ul-maash. *Hindi.*—Phulonka-har.	Fair.
23	Baboo Kunta Prasad, of Kanhauliy.	10	15th August, 1870.	Ditto ...	Not admitted in the College.	*English.*—Primer. *Hindi.*—Baran Mala. *Urdu.*—Tashrih-ul-Haruf.	Tolerable.
24	Baboo Sitesh Chandra Sannyal, of Cooch-Behar.	6	9th December, 1870.	Ditto ...	Ditto ...	*English.*—Primer. *Bengali.*—Barn Parchai.	

[No. VI.] *From* BABOO KEDAR NATH PALUDHI, *Superintendent, Wards' Institution, Benares, to* W. H. WRIGHT, ESQ., *Officiating Visitor Wards' Institution, Benares, (No. 4).—Dated Benares, the 1st June,* 1871.

WITH reference to the Officiating Commissioner's letter No. 168, dated the 29th ultimo, I have the honour to submit the following details of special causes under which lengthened terms of absence of the wards were permitted by the Officiating Commissioner.

2. Baboo Buddhi Nath Choudhari, of Dinajpore, obtained one month's extension of the Christmas vacation on account of the proposed marriage of his sister.

Lal Ram Singh of Barah had two weeks leave of absence on private affairs, of two weeks more on account of the birth of his son, and extension of about two weeks on account of his step-mother's sickness.

Baboo Hari Har Dutta and Shankar Dutta obtained special leave for one week to go to Vindhyachul, and for two days on account of Janmashtami.

Thakoor Jagmohan Singh had no leave of absence the year before last.

The Rajah of Tirwa had special leave of absence for one week to visit his father-in-law, two weeks' extension of the Christmas vacation, and for five weeks more on account of sickness.

The Rajah of Manda had no leave of absence the year before last.

The Rajah of Shewhur had extension of the summer vacation on account of his mother's *shradh*.

The Rajah of Kuttra overstaid his Christmas vacation by two weeks.

Baboo Sadhusaran Prasad had special leave of absence for about fifty-three days on account of his *gouna*, with extension to the end of the summer vacation; also he overstaid the winter vacation by about two and a half months on account of sickness.

. Sarfaraz Hoosein Khan had no winter vacation the year before last.

Baboo Mahabeer Prasad, Rajendra Prasad, Kunta Prasad, Rudraraj Nandan Singh, and Sitesh Chandra had no vacation the year before last on account of late admission into the Institution.

[No. VII.] *From* C. A. ELLIOTT, ESQ., *Officiating Secretary to Government, North-Western Provinces, to* A. COLVIN, ESQ., *Secretary, Board of Revenue,* (*No.* 950).—*Dated Nynee Tal, the* 19*th September,* 1871.

I HAVE received and laid before the Lieutenant-Governor your letter No. 640, dated 12th July last, submitting the Annual Report for 1870-71, on the management of the Wards' Institution at Benares, and am directed by His Honor to communicate the following remarks.

2. There were six admissions and five withdrawals during the year. Of the 24 wards, 8 only come from these Provinces, one is a Bundelkhund Chief, and the remaining 15 from Bengal. It is to be regretted that the Institution is not more largely taken advantage of by the leading families of the North-Western Provinces, which it might well be, seeing that it is open not only to wards, but to lads whose fathers are alive, as in the case of the three sons of the Barah Rajah, who has done well in providing so good an education and training for them.

3. The average leave of the 19 boys who were in the Institution last year has risen from 36 to 60 days, and in the three cases marginally* noted, the duration was excessive. Leave should in no case, without some special causes, exceed the College holidays. Indeed, as in a Hindoo family there are so many domestic occasions requiring the occasional presence at home of the wards, it would be better that those who are likely to be absent at other periods than the College vacation should remain at the Institution during the holidays.

* Baboo Sadhusaran, 194 days.
Rajah of Shewhur, 133 „
Tirwa Rajah, 119 „

4. Especial notice should be taken of boys who overstay their leave and refuse to return to the College when sent for through the Collector. In such cases a complete stoppage of leave for some time would seem to be a suitable punishment.

5. The great difficulties and special disadvantages in the early training of youth in this country, arising from their premature entry on the duties of domestic life, and the distraction of family cares, are evident from these yearly reports. Baboo Shiva Prasad is naturally anxious that his fellow-countrymen of high rank should aspire to scholastic distinctions; and the object is well worthy the ambition of the lads and their relatives, and of every exertion and encouragement on the part of Government. It has, however, been rightly pointed out that young men burdened with the cares of a family cannot be treated under the same roof and on the same system as boys of tender age. If the former are to be kept at Benares with the view of their reading for University honors, a boarding-house must be provided, or a separate and senior branch of the Institution established, where the inmates, while supervised in their general life, shall be left more their own masters than in the junior branch, which would then be devoted solely to the younger boys.

6. I am to commend this object to the attention of the Board. Indeed, as it is, the necessity under the present system, and with the existing limited accommodation, of having lads of mature age treated together with small boys seems of itself to demand some modification: there should evidently be a separate building and separate system for the former. If this can be arranged for, there is no objection to the Barah lads and other young men of their age remaining at the Institution.

7. The general expenditure was Rs. 12,019 according to the Report, but in Statement A. it is shown to have been only Rs. 10,279; while in Statement B. it is put down at Rs. 938 per mensem or Rs. 11,256 per annum. This expenditure is larger than His Honor was prepared to find. The Commissioner has done well in requiring regularity in the

submission of monthly accounts. With next year's Report, an abstract of the accounts of the Institution at large, giving disbursements classified under general heads, should be added.

8. The "individual charges" also require notice. According to Statement A., these amount to Rs. 16,825, but Statement B. represents them at Rs. 1,533 a month, or Rs. 18,396 per annum. The average expenditure is Rs. 58 a month, and in one or two cases it considerably exceeds this. There is no desire to deprive the wards of any reasonable indulgence and a servant and a horse, with a small sum for games and pocket-money, are admissible. But habits of extravagance are carefully to be checked, both as bad in themselves, and as specially injurious to the poorer wards, who no doubt are thus led to vie with their richer compeers. A uniform system of simple and economical expenditure should be enforced.

9. The Lieutenant-Governor has observed with much pleasure the hearty way in which Mr. Forbes has thrown himself, with so much kindly and genial spirit, into the amusements of the boys. He also deserves special thanks for pressing the necessity of neatness and cleanness in the rooms; and His Honor trusts that all persons connected with the Institution, or who have the opportunity of visiting it, will lose no occasion of enforcing on the wards the advantage of personal cleanliness in their dress and apartments.

10. Of the 24 boys, 22 attended the Queen's College, the remaining two being too young for admission. The progress made has been fair. The success of one of the wards—the young Rajah Sheoraj Nundun Singh of Shewhur—in gaining, after competition, the first prize in his class (in spite of his having been absent 133 days in the year), has been noticed by His Honor with much satisfaction, and the lad should be commended for his diligence.

11. The Lieutenant-Governor hopes that progress may be made in the class established under Mrs. Etherington for music and drawing, which is attended by nine of the wards.

12. On the whole, the results are satisfactory, and the Lieutenant-Governor had reason to be pleased with the In-

stitution on the occasion of his late visit. The promotion of active amusements among the wards, as well as of study, has given the lads an air of activity and energy seldom seen in the case of boys of the upper classes educated at home, combined with an intelligent and well-bred deportment. All this augurs well for the future usefulness of the wards.

13. With reference to paragraph 3 of your letter, I am to state that, as suggested, a copy of the Report, together with a copy of this reply, will be forwarded to the Government of Bengal for information.

14. The Report will be printed in the Proceedings of this Government, and spare copies for distribution will be supplied to the Board.

Art. IV.

METEOROLOGY OF THE NORTH-WESTERN PROVINCES.

[No. 1.]—*From* JOHN ELLIOTT, ESQ., B.A., *Officiating Reporter on Meteorology, to* C. A. ELLIOTT, ESQ., *Officiating Secretary to Government, North-Western Provinces (No. 83).* —*Dated Roorkee, the 20th April,* 1871.

I HAVE the honour to submit the Annual Report on the Meteorology of the North-Western Provinces for the year 1870.

It will compare somewhat unfavourably with the reports of previous years, as the theoretical knowledge and practical experience of Dr. Murray Thomson will be found wanting in the preliminary remarks. Continued ill-health compelled him in the latter part of 1870 to apply for sick leave, and he departed for England on the 16th of January, 1871. He handed over to me before he left the barometric, wind, thermometric charts, the annual tables for each station, and the detailed observations on the meteorology of each month, which form the bulk of the report.

Observing Stations, First-class.—During the year 1870, complete monthly returns were sent from thirteen first-class stations, and from five second-class stations. The former, at which barometrical and thermometrical observations are taken four times a day—*viz.*, at 4 A.M., 10 A.M., 4 P.M., and 10 P.M.—furnish all the data necessary for the determination of the meteorology of the station and its immediate neighbourhood. These stations are—Chukratta, Dehra, Roorkee, Meerut, Bareilly, Futtehgurh, Agra, Lucknow, Goruckpore, Ajmere, Allahabad, Benares, and Jhansie.

Raneekhet.—It was stated in the last yearly report that preparations were being made for the transferral of the Observatory at Nynee Tal to Raneekhet. This was effected in the beginning of 1870, and returns first came from it in April. They were for some months merely the same as those obtained from the second-class stations, and complete first-class returns were not sent until the month of December.

It was thought inadvisable to include these imperfect observations in this year's report. From the few complete returns which have arrived, some interesting results will, I think, follow from the observations taken at this station.

Second-class Stations.—The five minor stations from which returns were received during the year 1870 were Seetapore, Fyzabad, Nagode, Nowgong, and Bustee. Observations of the barometer, thermometer, amount of rain, and direction of the wind, are taken twice a day, at 10 A.M. and 4 P.M. The returns of these stations appear to me to be trustworthy and valuable, although the instruments used have not, like those employed at the chief stations, been tested for correctness. The first-class stations supply the necessary information for the leading features of the meteorology of the Province. They are, however, too far apart to give the complete key to the meteorology. For this it is necessary to fill in the details by the results obtained at the minor stations. This is especially necessary in the case of storms, where violent atmospheric changes sometimes occur within narrow limits. It is, therefore, to be regretted that the number of second-class stations is as yet so small.

No inspection of the various Observatories was made last year by Dr. Thomson. His ill-health rendered it necessary for him to spend the vacation in the hills, and postpone this duty for another year.

Supply of Instruments.—The supply of instruments continues to be precarious. Dr. Thomson, in October, indented on the Mathematical Instrument Depôt at Calcutta for a supply. Less than one-third of the instruments asked for were sent. The stock in hand is consequently becoming small, and will, I fear, not be sufficient to meet the demand until the next supply arrives from England.

Hourly Observations.—Another series of hourly observations was taken at Roorkee during the year, and the results combined, in a table given in page 21, with those of the three preceding years. The asterisks in this table of hourly observations show the maxima and minima readings for each day. They are unfortunately too few in number to furnish any

reliable conclusions. If we take the average of the observations already made, we have the following results. In March, the first minimum occurs at 4 A.M. The barometer from that time to 12 A.M. rises ·1 inch. It then falls through ·088 inch until 5 P.M., and rises again through ·083 inch until 12 P.M. The greatest change, therefore, occurs between 4 A.M. and 12 A.M.

In June, the first minimum reading of the barometer is at 4 A.M. It rises ·058 inch, and reaches its maximum at 11 A.M. The second minimum is attained at 5·30 P.M., and is ·06 inch below the previous maximum reading. The second maximum reading occurs at 11 P.M., and is ·038 inch above the last minimum reading.

In September, the first minimum reading is at 4 A.M. It then rises ·066 inch, reaching its maximum at 10 A.M. From this hour to 5 P.M. it falls through ·093, and again rises ·064 until 11 P.M., when it reaches its second maximum.

In December, the first minimum occurs at 5 A.M. The barometer rises ·087 until 11 A.M., falls through ·091 until 4 P.M., and then rises through ·058 until 12 P.M.

From the above we see that the greatest daily variation takes place in spring.

Monthly Reports.—The detailed remarks on the weather of each month are, with the exception of a few additional remarks, identical with the monthly reports of the weather which were published in the *Government Gazette* during the year 1870. Those of the year 1869 contained the mean monthly barometric pressure of four stations—Roorkee, Agra, Benares, and Lucknow. Two other stations—Goruckpore and Ajmere—were added in the beginning of last year. As the readings for these stations are not reduced to the sea-level, I add the height of the stations and their positions:—

	Latitude.				*Longitude.*				*Heights.*	
Roorkee	... 29°	52′	0″	N.	77°	57′	15″	E.	880	*feet.*
Agra	... 27°	10′	0″	N.	78°	5′	0″	E.	551	,,
Lucknow	... 26°	5′	45″	N.	80°	57′	40″	E.	500	,,
Goruckpore	... 26°	46′	1″	N.	83°	18′	7″	E.	340	,,
Benares	... 25°	20′	0″	N.	83°	0′	0″	E.	260	,,
Ajmere	... 28°	26′	0″	N.	74°	37′	0″	E.	1,800	,,

The other table which gives the temperature and humidity is simply the mean of the monthly values of those for the six stations already named, and may, therefore, from the positions of the towns, be taken as fairly representing the average for the whole North-Western Provinces.

Barometric and Temperature Charts.—Barometric and temperature charts have been drawn up, at the wish of Government, for publication in the present report. These give only the monthly range of the barometer and the thermometer, and are not so valuable as the charts published in the Report for 1868. In the latter the daily readings of these two instruments were represented by curves, and thus instead of having either the maximum or the mean monthly range represented, as in the present charts, the daily variation was given, and thus at a glance all, except brief and unimportant atmospheric changes of pressure and temperature, were seen at a glance, and also by a comparison of the curves for the various stations, it could be quickly seen over what district any of the great atmospheric variations occurred, and in what directions and rate it travelled.

If the publication of these charts is to be continued in future reports, it might perhaps be a subject for consideration whether charts similar to those of 1868 instead of 1870 should be adopted, and also whether these monthly charts for the more important meteorological stations should not first of all be published with the monthly report in the *Government Gazette*, and afterwards in the annual report. This would increase considerably the cost of publication, but would add greatly to the value, interest, and precision of the monthly reports.

Lectures at the Agra Medical School.—A course of practical lectures on the mode of obtaining and recording the various meteorological observations was given at the Agra Medical School to the senior students by Meer Ultaf Ali, the Assistant at the Observatory. Dr. Thomson held a written examination on the subject, similar to those of preceding years. The results were much less satisfactory than in 1869. The total number of marks assigned for the paper was 100. The two

students who gained the highest number of marks were Abdool Hakeem (who had 39) and Ram Lall (33). In 1869, the greatest number of marks obtained were 59 per cent. In 1870 there were in all 12 students examined, and the average number of marks obtained was only 25 per cent.

Barrack Returns.—During the last two months of the year a number of temperature returns for the barracks of the chief Military stations in the North-Western Provinces were sent to the Meteorological office for revision and transmission to the Sanitary Commissioner with the Government of India. These returns give the temperature of the external air, of the verandahs, and of the rooms. If they furnish any valuable results, these will probably be included in the Report for the year 1871.

RETROSPECT OF THE WEATHER AND REMARKS ON THE CLIMATE IN THE NORTH-WESTERN PROVINCES, IN 1870.

THE EARLY COOL SEASON, INCLUDING JANUARY, FEBRUARY, AND MARCH.

JANUARY.

Year.	Barometer.											
	Roorkee.		Agra.		Lucknow.		Goruckpore.		Ajmere.		Benares.	
	10	16	10	16	10	16	10	16	10	16	10	16
1870	29·110	29·024	29·460	29·348	29·704	29·592	29·754	29·638	28·375	28·296	29·789	29·687
1869	29·202	29·112	29·526	29·423	29·811	29·694	29·862	29·739	28·428	28·358	29·876	29·770
1868	29·194	29·110	29·535	29·426	29·776	29·665	...	...	...	...	29·872	29·845
1867	29·190	29·094	29·557	29·458	...	...	...	...	...	...	29·940	29·852

Year.	Thermometer.					Hygrometer.							
	Maximum in Sun's rays.	Minimum on Grass.	Maximum in Shade.	Minimum in Shade.	Mean in Shade.	Dry.		Wet.		Difference.		Humidity.	
						10	16	10	16	10	16	10	16
1870	121	36	74	44	61	63	73	54	58	9	15	53	54
1869	118	37	74	46	61	63	72	54	58	9	14	54	40
1868	105	38	70	45	59	60	68	54	58	6	10	65	54
1867	120	39	67	48	62	64	70	56	60	7	10	64	57

On looking over the above mean barometer readings, it will be seen that the air-pressure was less in January of this year than it has been in any of the preceding years. The difference is very nearly ·067 of an inch less than the average pressure of the four years. The year which showed the next lowest barometer readings was 1868, but the difference between that year was less marked than the difference between 1870 and the other years. The mean air-pressure was from ·050 to ·060 less in January than in the previous month of December. The report for the latter month notices that from the 25th to the end the barometer fell slightly. This falling was continued on into the first three or four days of January, although on the 1st the air-pressure was relatively high to the rest of the month; indeed, in the majority of places the 1st showed the highest reading that occurred in January. From the 1st to the 4th the barometer slowly fell; on the 5th and 6th it rose, declining slightly on the 8th; again rose on the 9th, from which date to the 15th it slowly fell; and on the evening of the next day, the 16th, it fell suddenly, but rose on the 17th to the height it had been at for some previous days. It continued to rise till the 21st or 22nd, on which days high pressures prevailed. From the 22nd it fell slightly, keeping, however, pretty steady at about one-tenth above the monthly mean to the end.

The temperature was more than usually uniform over all the North-Western Provinces, commencing pretty low, it declined further till the 6th; then in some places it rose on the 7th; but fell suddenly on the 8th and 9th, and kept low till the 13th or 14th. This was a very cold period: the mornings were frequently bitterly cold. Both the day and the night thermometers showed higher temperature from the 15th on to the 19th; but this warmer period was again succeeded by a cold one lasting till the 25th; after the 25th the weather was notably warmer both to the feelings and to the instruments.

In the more North-Western Provinces the general weather

observed was to have a clear sky up to the 16th or 17th, when it became overcast and remained more or less so for the next three or four days. Rain seemed as if about to fall, but it only did so in one station (Dehra). In the more southern and eastern provinces there were two cloudy periods—the first five or six days, and the three or four days succeeding the 17th. In several of the stations of this part of the country rain fell on the 5th, but always in slight showers. The remarks on the barometer will have already shown that both of these periods were connected with a falling barometer, the second cloudy period succeeding to the sudden fall which took place on the 16th. After the 21st, to the end of the month, clear bright weather prevailed all over the North-Western Provinces.

The health reports were all satisfactory. In stations where fever cases had been of frequent occurrence it was stated that these were becoming much less numerous.

FEBRUARY.

Year.	Barometer.											
	Roorkee.		Agra.		Lucknow.		Goruckpore.		Ajmere.		Benares.	
	10	16	10	16	10	16	10	16	10	16	10	16
1870	29·067	28·976	29·399	29·289	29·644	29·526	29·732	29·593	28·329	28·249	29·733	29·627
1869	29·114	29·046	29·463	29·349	29·703	29·577	29·737	29·613	28·388	28·309	29·782	29·661
1868	29·094	29·021	29·448	29·351	29·675	29·567	...	...	...	...	29·771	29·667
1867	29·099	29·014	29·477	29·383	...	...	...	...	...	...	29·889	29·764

Year.	Thermometer.					Hygrometer.							
	Maximum in Sun's rays.	Minimum on Grass.	Maximum in Shade.	Minimum in Shade.	Mean in Shade.	Dry.		Wet.		Difference.		Humidity.	
						10	16	10	16	10	16	10	16
1870	128	42	81	50	68	70	80	60	63	11	17	48	36
1869	129	47	80	52	67	69	78	57	60	12	18	49	35
1868	112	43	74	52	66	67	77	58	60	9	14	59	44
1867	124	39	76	48	68	66	75	58	62	7	12	62	51

It may be seen from the above barometer table that the mean readings for this year are lower than those for the corresponding months of the other three years. Compared with the previous year, which had a high barometer, the lowness of the air-pressure is more marked than in the other years. Especially is this the case in Roorkee, Agra, and Lucknow, but it is not so much so in Benares and Goruckpore. Compared with January, the mean air-pressure was ·040 of an inch lower in February. In nearly all the barometer stations the air-pressure declined, although slightly, from the 22nd of January to the end of that month. This falling was continued into February as far as the 3rd and 4th, on either of which days the lowest readings of the months occurred in most places. It continued low till the 6th, rose through the 7th and 8th, and made a marked descent on the evening of the 9th. This fall preceded the storm and rain of the 10th. The pressure rose again on the 11th, but declined slightly on the evening of the 12th. This again preceded a storm and rain-fall on morning of 13th. There was a rapid rise later on the 13th, but it fell again towards the 16th and 17th. This was more observed in the north-westerly stations. On the 19th it again rose swiftly, so that in some places the highest readings of the month occurred on that day. The 21st and 22nd showed a falling barometer; the 23rd, 24th, and 25th a rising one. It was on the last-named date that in most stations the barometer reached its highest. From the 25th to the end the pressure continued high, but with a slight falling tendency.

The temperature rose during the first week, and this rise was followed by a marked depression which was nearly co-extensive with the period of clouds and easterly wind noticed between the 8th and the 13th. This depression, however, occurred more in the day than the night hours; indeed, in the latter there was a distinct rise which reached its highest on the 11th or 12th, apparently just before the thunder-storm which happened on the last-named day. On the 13th there was a notable depression which followed this

same storm. After the 15th, the heat increased almost steadily to the end of the month, and this was the case both with the day and the night hours.

The general weather which prevailed during February was as follows:—The month opened with fair clear weather, the wind being somewhat variable, but east and west were the main directions. After the first week a tendency to change was observed; clouds began to gather, and the wind became more easterly than westerly. A sharp thunder-storm with rain and hail took place on the 10th; the storm was observed in nearly all the more north-westerly stations except Meerut and Agra, in which—as in other places—a storm only threatened, or was very mild. There was a second storm, with heavier rain, on the evening of 12th and morning of 13th. The rain on the 12th and 13th was observed over a wider area than that of the 10th. After the 13th the sky cleared and the wind changed to a westerly direction, and the weather thus remained till the end of the month. In the last week of the month the weather was hotter during the day hours; and during this period, but including the third week as well, high winds, with clouds of dust, were very common.

MARCH.

Year.	Barometer.											
	Roorkee.		Agra.		Lucknow.		Goruckpore.		Ajmere.		Benares.	
	10	16	10	16	10	16	10	16	10	16	10	16
1870	28·999	28·914	29·327	29·217	29·567	29·449	29·632	29·500	28·257	28·177	29·652	29·540
1869	29·102	28 972	29·365	29·255	29·611	29·491	29·653	29·527	28·291	28·214	29·687	29·581
1868	29·050	28·974	29·381	29·278	29·607	29·493	...	...	...	...	29·695	29·580
1867	29·049	28·951	29·409	29·306	...	...	...	...	...	...	29·766	29·658

Year.	Thermometer.					Hygrometer.							
	Maximum in Sun's rays.	Minimum on Grass.	Maximum in Shade.	Minimum in Shade.	Mean in Shade.	Dry.		Wet.		Difference		Humidity.	
						10	16	10	16	10	16	10	16
1870	138	51	87	60	74	77	85	64	66	13	19	37	36
1869	139	51	87	59	73	77	84	69	66	13	18	50	58
1868	118	50	84	60	74	76	82	61	64	15	19	42	32
1867	127	53	88	59	75	79	87	65	68	14	21	47	39

The mean height of the mercury was lower in March of this year than in the corresponding months of the three previous years, the difference being from two to four-hundredths of an inch. The monthly mean of March was on an average ·067 lower than that of February. Towards the end of the latter month, the barometer was high, and it continued thus for the first four or five days of March, excepting in Goruckpore and Ajmere. On the 5th and 6th the barometer rapidly rose and even attained its highest monthly height in Roorkee and Goruckpore on these days. From the 6th the pressure slowly fell to the 15th in the more north-western stations—reaching its lowest on the 13th, 14th, or 15th. From the 15th the pressure again rose to the 20th or 21st, on the latter day reaching its highest in many places. From the 21st the pressure dropped, but not to a very great extent; but a further sudden drop occurred on the 28th, after which the barometer continued low till the last day.

Compared with February, the temperatures were about ten degrees higher in the night and six degrees higher in the day-time. There was a sudden depression of temperature on the 6th, which followed a rain-fall that occurred in many places, especially those in the higher parts of the Doab. From the 6th the temperature may be said to have risen to the 17th, although in some stations depressions more or less great occurred in the interval. On the 18th there was another fall in the heat. Thence it rose to the 21st or 22nd, again to fall on the 24th or 25th. From this date the heat rose pretty steadily to the end in a few stations; but in most there was another marked depression on the 28th, after which the heat got greater to the last day.

The month opened with fair clear weather; but on the 6th the sky was overcast and rain fell in some places, and it threatened rain in most of the others. After this rain fair dry weather returned, and lasted till the 12th or 13th, which were wet dull days. In nearly all the stations clouds were seen from the 12th on to the end of the month. The 17th, 18th, 19th, and 20th, were also days on which rain fell com-

monly, accompanied with thunder and lightning, and, as above noticed, by a fall of the temperature and barometer. The 24th and 25th were both wet days, as also were the three last. On all these days the barometer had a falling tendency, and the rain was followed by a depression of temperature. The wind was west or north-west, or it was still altogether.

GENERAL REMARKS ON THE COOL SEASON OF 1870.

The mean temperature of this period in 1870 (67·70°) differed slightly from the average of the corresponding period of 1869, when it was 67°. The first fortnight was dry and clear; after this clouds gathered, but no rain fell. The last week of January and the first of February were clear and fine. Thunderstorms cooled the air during the remainder of the month. The first half of March was clear; but after the middle of the month several thunderstorms, accompanied by heavy showers of rain, delayed the arrival of the hot weather.

THE HOT SEASON OF 1870, WHICH INCLUDED THE MONTHS OF APRIL, MAY, AND THE FIRST TWELVE DAYS OF JUNE.

The hot weather of 1870 thus extended over a period of two months and twelve days, and was slightly (about a week) shorter than the corresponding period of the previous year.

The average temperature was 92°. In the years 1869 and 1868 the mean was 93°. This difference arose from a diminished day temperature. This was probably due to the greater humidity of the atmosphere during this period in 1870 than in the two previous years.

APRIL.

Year.	Barometer.											
	Roorkee.		Agra.		Lucknow.		Goruckpore.		Ajmere.		Benares.	
	10	16	10	16	10	16	10	16	10	16	10	16
1870	28·926	28·823	29·233	29·112	29·471	29·351	29·530	29·367	28·187	28·103	29·551	29·439
1869	28·917	28·832	29·253	29·139	29·458	29·343	29·547	29·411	28·233	28·152	29·552	29·436
1868	28·921	28·838	29·272	29·147	29·477	29·347	...	...	...	...	29·550	29·442
1867	28·945	28·849	29·298	29·178	...	...	...	...	...	...	29·664	29·568

Year.	Thermometer.					Hygrometer.							
	Maximum in Sun's Rays.	Minimum on Grass.	Maximum in Shade.	Minimum in Shade.	Mean in Shade.	Dry.		Wet.		Difference.		Humidity.	
						10	16	10	16	10	16	10	16
1870	147	60	97	66	84	88	95	68	69	20	26	36	27
1869	154	60	102	69	86	92	100	68	71	25	29	29	22
1868	124	58	98	70	85	89	96	68	69	21	26	38	28
1867	129	62	98	68	87	89	95	72	73	17	24	53	35

The mean height of the barometer did not greatly differ from that of former years; but, taking into view all the stations, the pressure was rather less this year. Compared with the previous month, the air-pressure had dropped about nine-hundredths of an inch. At the end of March the barometer had been falling, except on the last day, when it showed an upward tendency; this upward movement was continued into April three days—from the 3rd to the 6th it fell rapidly, and from the latter date to the 16th it fluctuated at nearly its mean monthly height; from the 16th to the 24th it kept steadily above its mean, while from the 24th to the 27th it was as steadily below its mean. During the last three days there was a rapid rise in the air-pressure. The highest barometer readings took place on the 2nd, 3rd, or 4th—chiefly the 3rd; and the lowest on the 24th or 25th —chiefly the latter date.

The temperature curves were, on the whole, uniform in all the stations. From the 1st to the 6th there was a rapid rise of 14 degrees on an average, while from the 7th to the 9th, 10th, or 11th, there was a rapid fall of about 8 degrees. From the 11th to the 23rd there was a steady rise, and from 23rd to 28th a rapid fall, after which the temperature rose to the end of the month. Compared with the temperature of March, that of April was 10 degrees higher in the day, and 6 degrees higher in the night time.

The first two days of April were generally overcast, and in one or two places very slight rain fell. From the 3rd to the 6th the sky was clear, and the weather fine, although the barometer was falling. On the 8th, however, the fall ushered in two or three days of cloudy unsettled weather. From the 9th or 10th on to the 20th the weather was fair, and the heat almost daily rising higher and higher. About the 20th the wind varied in most places from the south-west or west to east or south-east, and clouds began to gather. But it was not till the 23rd that the weather decidedly changed. Heavy duststorms, with slight rain and with

thunder and lightning, occurred in many places on the 23rd. It remained fair but cloudy on the 24th; but on the 26th, 27th, and 28th, and in a few places the 29th also, somewhat violent duststorms occurred, generally towards sunset. It was in this period that the air-pressure and temperature fell. In Roorkee the storm on the evening of the 26th was a very violent one, and was prolonged far into the night. Compared with former years this April was cool, punkhas were hardly ever required even in the day hours, and hot winds were nowhere prevalent.

Fevers prevailed in a very few places; but, on the whole, the month was healthy.

MAY.

Year.	Barometer.											
	Roorkee.		Agra.		Lucknow.		Goruckpore.		Ajmere.		Benares.	
	10	16	10	16	10	16	10	16	10	16	10	16
1870	28·723	28·634	29·049	28·946	29·272	29·158	29·353	29·218	28·064	27·991	29·365	29·262
1869	28·758	28·669	29·063	28·962	29·322	29·192	29·389	29·260	28·056	28·011	29·394	29·285
1868	28·874	28·790	29·179	29·073	29·443	29·292	...	...	...	...	29·502	29·404
1867	28·787	28·684	29·140	29·046	...	...	...	...	...	...	29·416	29·318

Year.	Thermometer.					Hygrometer.							
	Maximum in Sun's Rays.	Minimum on Grass.	Maximum in Shade.	Minimum in Shade.	Mean in Shade.	Dry.		Wet.		Difference.		Humidity.	
						10	16	10	16	10	16	10	16
1870	152	68	109	77	94	99	106	71	72	28	34	26	21
1869	164	74	109	82	94	101	109	76	76	25	33	34	22
1868	133	64	103	75	91	95	101	73	74	22	27	34	25
1867	130	66	105	74	91	95	101	73	74	22	27	38	29

The air-pressure was on an average two-hundredths lower than last year; but there was an exception to this at Ajmere, where at 10 hours it was slightly higher. May of 1869 had an air-pressure fully one-tenth lower than that of 1868, while the air-pressure of May, 1867, was nearly midway between that of 1868 and 1869. Of the four years, therefore, May of 1868 had the highest air-pressure, 1867 the next highest, 1869 the next, while 1870 had the least of all. The barometer readings of May, as compared with those of April, were about seventeen-hundredths lower. The barometer had shown a rising tendency in the last three days of April. On the 1st of May it was still high; indeed, with relation to the rest of the month, the highest readings took place on the 1st. From the 1st the air-pressure declined till the 11th, but with an interruption on the 6th and 7th, on which days it rose slightly. From the 11th till the 16th it rose, but not greatly, and from the 16th till the 22nd it fell, but again not very markedly. It rose again on the 23rd, and kept above its mean monthly height till the 27th, when it rapidly fell on to the last day. The lowest barometer readings were obtained at most places on the 30th.

The temperature was nearly uniform for all the stations. The heat rose from the 1st to 3rd, and from thence to the 8th it fell. From the 8th to the 16th there was a marked rise—more marked, however, in the day than the night hours. From the 16th to 24th the temperature fell; but there were several exceptions to this: of these, Allahabad and Benares were the most noteworthy. From the 24th till the 27th it rose, falling from that date on to the last day. There was a rise of full ten degrees in May as compared with April.

The weather during May was hot, dry, and for more than half of the month cloudless. The lower levels of the atmosphere, as is usual at this season of the year, were densely hazy. The wind was usually north-west or west up till the 18th

day. A change to the east or south-east was then the rule. This change of wind brought up the clouds, which were after that time seen till the end of the month. At this period also several dust-storms occurred. The 23rd and 30th were the days on which the storms were the most frequent; they occurred also, but less frequently, on the 26th. There were also high winds, approaching in strength to storms, on other days, as the 20th and 21st. The storms of the 23rd, and in som places those of the 30th also, were accompanied by slight rain.

THE FIRST TWELVE DAYS IN JUNE.

Year.	Barometer.												Thermometer.					Hygrometer.							
	Roorkee.		Agra.		Lucknow.		Goruckpore.		Ajmere.		Benares.		Year.	Maximum in Sun's Rays.	Minimum on Grass.	Maximum in Shade.	Minimum in Shade.	Mean in Shade.	Dry.		Wet.		Difference.		Humidity.	
	10	16	10	16	10	16	10	16	10	16	10	16							10	16	10	16	10	16	10	16
1870	28·693	28·597	29·024	28·914	29·234	29·118	29·322	29·191	28 059	27·969	29·333	29·213	1870.	160	77	110	83	98	101	107	80	79	21	28	37	27

During this period the mean barometric readings were very nearly the same as at the end of May. On the 30th of May the lowest readings of that month were observed, on the 6th and 7th of June the barometer rose; and on the 10th and 11th fell slightly.

The mean temperature during this part of the month was 98° in the shade. The heat was great (except on the 8th or 9th) until the 11th, on which day it fell suddenly from 10 to 18 degrees.

Along with a south-east wind, which set in on the 18th of May, clouds were observed to overspread the sky at nearly all the stations. These clouds were apparently the forerunners of the south-west monsoon.

These clouds, however, came and went all through the latter part of May, and during the first ten days of June were but little seen. They reappeared about the 11th or 12th, and along with them a notable increase in the moisture of the air occurred, and also the great fall in temperature already noticed.

GENERAL REMARKS ON THE HOT SEASON OF 1870.

The barometer during the month of April was slightly higher than during the corresponding months of the two previous years. In May it was, on the contrary, considerably below (from ·05″ to ·06″) the average given by the three previous years.

The mean temperature during this period was 90·5°, differing very little from the mean of the preceding year for the same two months. The temperature of the month of April was slightly below the average, and it was much less dry than in April, 1869. May, on the other hand, had the same average temperature in both years, but was rather drier in 1870 than in 1869.

These two months may be regarded as the type of a favourable Indian hot weather in the North-Western Provinces.

The large number of thunder-storms in February and March delayed the arrival of the hot weather, and the air did not become excessively dry until the middle of May.

THE RAINY SEASON

Includes this year the last nineteen days of June, all July, August, September, and October :—

THE LAST NINETEEN DAYS OF JUNE.

Year.	Barometer.										Thermometer.				Hygrometer.				
	Roorkee.		Agra.		Lucknow.		Goruckpore.		Ajmere.		Benares.		Maximum in Sun's Rays.	Minimum on Grass.	Maximum in Shade.	Minimum in Shade.	Mean in Shade.	Dry.	Wet.	Difference.	Humidity.
	10	16	10	16	10	16	10	16	10	16	10	16									
1870 ...	28·694	28·607	28·933	28·839	29·224	29·140	29·320	29·217	27·952	27·891	29·319	29·241									

Year.	Maximum in Sun's Rays.	Minimum on Grass.	Maximum in Shade.	Minimum in Shade.	Mean in Shade.	Dry.		Wet.		Difference.		Humidity.	
						10	16	10	16	10	16	10	16
1870 ...	152	75	99	77	88	89	92	80	78	9	14	68	60

The barometer rose slightly on the 12th and still more markedly on the 13th. From that date it fell with considerable steadiness till about the 18th, 19th, or 20th. It was, however, lowest at most places on the 18th. The barometer after this rose steadily up to the 26th, and from thence continued slightly above its monthly mean height to the end. The highest readings of the barometer were observed on the 13th and the lowest on the 18th. The temperature, as has been already remarked, fell very suddenly on the 11th from 10 to 18 degrees. This fall was a little more extensive on the day than on the night hours. The temperature continued low till the 16th or 17th, but rose on the 18th or 19th, but again fell on the 20th or 21st. The lowest temperature in the shade, both of the day and night, was observed on the 28th.

No rain-fall occurred immediately after the sudden decrease of temperature on the 11th or 12th. The aspect of the weather was, however, that of the setting in of the monsoon. Nearly all the stations had had a good rain-fall on or before the 18th, after which a break ensued till the 20th or 21st, and a second similar interval occurred, specially in places eastward of Futtehgurh, from the 21st to the 25th or 26th. During the last four or five days rain was frequent and heavy all over the Western Provinces and Oudh. Some of these heavy falls may be here noted :—Roorkee, 1·70 inches on 29th; Meerut, 6·10 on 28th, and 5·50 on the 26th; Bareilly, 4·20 on 29th, and 8·50 on the 30th; Futtehgurh, 2·30 on 25th; Agra, 1·62 on 26th, and 1·57 on 27th; Lucknow, 2·28 on 26th, 3·31 on 27th, 3·03 on 28th; Seetapore, 4·00 on 28th, and 3·00 on 29th; Fyzabad, 3·20 on 27th, 3·30 on 28th, and 2·10 on the 29th; Nowgong, 2·80 on 26th.

The following table gives the total rain-falls for the month of June in this and the three preceding years :—

RAIN-FALLS FOR JUNE.

Stations.	1870.	1869.	1868.	1867.
Chukratta	10·75	3·72	...	...
Dehra	7·09	2·98	6·85	7·30
Roorkee	4·94	2·43	4·24	8·05
Meerut	12·55	0·25	...	3·12
Bareilly	14·20	0·60	...	7·30
Futtehgurh	9·10	0·10	...	...
Agra	4·30	0·20	2·20	3·17
Lucknow	9·53	0·19	3·40	7·50
Goruckpore	4·70	1·05	...	12·40
Ajmere	3·40	...	1·10	1·37
Allahabad	4·47	...	...	4·89
Benares	4·00	3·60	10·10	5·30

The following tables give the usual average results for the whole of the month of June :—

Year.	Barometer.															
	Roorkee.		Agra.		Lucknow.		Gorackpore.		Ajmere.		Benares.					
	10	16	10	16	10	16	10	16	10	16	10	16				
1870...	28·693	28·603	28·999	28·899	29·228	29·191	29·321	29·206	27·995	27·922	29·325	29·233				
1869...	28·632	28·532	28·938	28·832	29·192	29·078	29·267	29·159	27·960	27·890	29·263	29·167				
1868...	28·678	28·581	28·996	28·898	29·228	29·119	...	...	...	...	29·325	29·224				
1867...	8·695	28·617	29·027	28·940	...	...	...	...	...	...	29·323	29·239				

Year.	Thermometer.						Hygrometer.					
	Maximum in Sun's Rays.	Minimum on Grass.	Maximum in Shade.	Minimum in Shade.	Mean in Shade.	Dry.		Wet.		Difference.		Humidity.	
						10	16	10	16	10	16	10	16
1870...	147	76	102	80	90	93	98	77	77	16	21	47	40
1869...	154	78	106	83	95	97	79	79	78	18	26	45	36
1868...	122	77	101	81	91	93	78	78	80	15	18	54	55
1867...	128	76	103	79	90	92	78	78	79	14	18	54	40

JULY.

Year.	Barometer.											
	Roorkee.		Agra.		Lucknow.		Goruckpore.		Ajmere.		Benares.	
	10	16	10	16	10	16	10	16	10	16	10	16
1870	28·636	28·559	28·929	28·840	29·171	29 077	29·264	29·168	27·924	27·869	29·270	29·183
1869	28·685	28·606	28·977	28·887	29·232	29·168	29·290	29·212	27·944	27·874	29·299	29·217
1868	28·694	28·613	28·996	28·909	29·231	29·134	...	...	...	...	29·328	29·234
1867	28·677	28·605	29·012	28·939	...	...	...	...	...	...	29·288	29·220

Year.	Thermometer.					Hygrometer.							
	Maximum in Sun's Rays.	Minimum on Grass.	Maximum in Shade.	Minimum in Shade.	Mean in Shade.	Dry.		Wet.		Difference.		Humidity.	
						10	16	10	16	10	16	10	16
1870	138	75	93	78	85	87	89	80	81	7	8	77	70
1869	145	76	93	78	86	88	91	80	81	8	10	71	66
1868	139	74	98	81	89	91	93	80	80	11	13	60	57
1867	122	78	93	78	84	87	89	80	80	7	9	70	63

During the three years—1868, 1869, 1870—the mean air-pressure became less and less. It was less by about three or four hundredths this year as compared with last, and that of 1869 was less than that of 1868, but by a much smaller amount, sometimes nothing at all, and never exceeding two-hundredths. At the places where comparison can be made between the air-pressures of 1870 and 1867, it may be seen that it was less also in the former year than in the latter. In connection with this general deficiency of air-pressure, it may be noticed that the humidity of July of this year is higher than that of any of the preceding years. The mean air-pressure of July was about five-hundredths below that of June. It stood almost exactly at the same point on the 1st of July as on the 30th of June. From the 1st to the 3rd the barometer fell, and then rose rapidly on the 4th, keeping high till the 6th. It fell on the 7th and 8th, but again rose on 9th, 10th, and 11th. The 12th, 13th, and 14th were days of low air-pressure, thence it rose on the 15th, and kept pretty steadily at its monthly mean in the more westerly but falling below that point in the easterly and south-easterly stations. A slight rise took place on the 23rd; but after that the barometer height fluctuated about its monthly mean height; but there was a difference here again between the west and the east—in the former a higher pressure was maintained, while in the latter it was lower, so as to be distinctly below the monthly mean. This circumstance is also illustrated by the fact that the lowest reading of the barometer in all stations west of Lucknow occurred on the 13th or 14th; but to the east of it on the 30th. The highest readings were observed at nearly all places on the 5th.

The range of temperature, as is usual in the rainy season, was very limited—thirteen and fourteen degrees being all that was shown even with self-registering thermometers. There was great correspondence between the temperatures of the night and day. Every rise and fall seemed to have continued through twenty-four hours, so that their effects

were shown on both the maximum and minimum thermometers. Generally the temperature was rising and high in the first half of the month, and falling and low in the second half. The 21st was generally a day of heavy rain, and on that day a great depression of temperature occurred.

The weather during July was close and damp, clouds overspread the sky nearly all through the month. In the first three or four days rain fell, and often very copiously. After the 4th in all the stations to the west and north-west but little rain fell till the 14th or 15th; but in the easterly stations, notably Goruckpore and Benares, the first ten days were very wet. In the former place nearly all the rain-fall of the month was confined to the first ten days. The latter half of the month was generally a rainy period, and in many places—as Dehra, Bareilly, and Allahabad—rain fell in every one of the last ten days.

The following table gives the total rain-falls for July in this and the three preceding years :—

Stations.	1870.	1869.	1868.	1867.
Chukratta ...	16·30	8·85	...	...
Dehra ...	33·13	20·69	21·30	25·30
Roorkee ...	14·60	8·04	10·81	13·39
Meerut ...	9·48	7·60	8·83	14·77
Bareilly ...	10·00	8·45	9.65	16·80
Futtehgurh ...	8·70	14·05	...	...
Agra ...	9·38	6·00	12·50	12·70
Lucknow ...	15·81	16·86	5·90	27·30
Goruckpore ...	20·10	6·20	9·10	18·50
Ajmere ...	7·30	4·65	6·38	7·00
Allahabad ...	16·50	7·15	...	...
Benares ...	19·55	12·75	9·75	13·60
Bansie ...	4·90	29·83	9·40	23·60

Some heavy rain-falls which occurred within twenty-four hours are here noted:—At Chukratta, on 3rd 1·86, and on 27th 1·43; Dehra, on 1st 5·90, on 7th 2·28, 8th 2·00, 10th 4·29, 18th 2·59, 19th 1·68; Roorkee, on 11th 1·53, 17th 3·38, 20th 4·21; Meerut, on 5th 2·70, 24th 1·60; Bareilly, on 21st 2·20; Futtehgurh, on 24th 1·80, and 25th 2·20; Agra, on 21st 2·18, 24th 2·21, and 26th 3·12; Lucknow, on 4th 1·62, 22nd 5·40, and 31st 1·40; Goruckpore, on 4th 2·80, 7th 1·40, 8th 4·80, 9th 4·30; Ajmere on 22nd 2·10; Allahabad, on 1st 1·66, 20th 1·30, 21st 1·80, 23rd 1·80, 26th 3·30, and 31st 1·75; Benares, on 8th 3·75, 11th 2·05, 21st 2·30, 25th 1·80, 28th 1·50, and 29th 1·30; Jhansie on 21st 2·50.

AUGUST.

Year.	Barometer.											
	Roorkee.		Agra.		Lucknow.		Goruckpore.		Ajmere.		Benares.	
	10	16	10	16	10	16	10	16	10	16	10	16
1870 ...	28·717	28·638	29·029	28·941	29·276	29·159	29·310	29·236	28·124	27·961	29·360	29·273
1869 ...	28·759	28·669	29·064	28·964	29·325	29·210	29·387	29 208	28·046	27·680	29·406	29·305
1868 ...	28·703	28·622	29·034	28·946	29·269	29·171	...	...	...	...	29·370	29·289
1867 ...	28·738	28·654	29·047	28·874	...	...	...	...	...	...	29·374	29·289

Year.	Thermometer.					Hygrometer.							
	Maximum in Sun's Rays.	Minimum on Grass.	Maximum in Shade	Minimum in Shade.	Mean in Shade.	Dry.		Wet.		Difference.		Humidity.	
						10	16	10	16	10	16	10	16
1870 ...	136	73	91	77	83	85	87	79	80	6	7	76	73
1869 ...	147	76	93	79	86	89	92	81	82	8	10	72	69
1868 ...	143	76	95	83	89	90	95	80	81	10	14	68	65
1867 ...	118	77	90	81	85	84	87	78	80	6	7	72	70

The air-pressure was lower by from two to five-hundredths than in 1869; while, compared with 1868, it was higher in Roorkee, but lower in Agra, Lucknow, and Benares. At Lucknow it was, however, lower at the 10 o'clock reading only. The difference between these two years (1870 and 1868) was small—not exceeding two hundredths in either way. Compared with 1867, the pressures were lower by about two-hundredths of an inch. The mean-pressure rose from six-hundredths to one-tenth as compared with July. The barometer had shown a rising tendency in the last three days of July. This rise seemed to reach its maximum on the 1st of August: for then it began to fall to the 3rd, but rose immediately through the 4th, 5th, 6th, 7th, 8th, and in a few places on the 9th also; then it dropped until the 15th, and was rather below than above the monthly mean till the 25th; then it rose quickly, and kept high on 26th, 27th, 28th, and 29th, and then fell rapidly to the last day. The highest air-pressures were recorded on the 6th, 7th, 8th, 9th, or on the 29th, and the lowest on either the 14th or 15th.

Although the temperature curves for all the stations show a general resemblance, yet in several instances the minor rises and falls did not occur on the same day. There was a general steadiness of temperature during the two mid-weeks of the month, and it will be seen that in this period there was fair weather, and a more or less westerly wind. There were marked and sudden depressions of the heat on the 20th and the 23rd, but in the more northerly and westerly stations—as Roorkee, Meerut, Agra, and Bareilly—this latter depression was postponed till the 25th or 26th. The heat had become greater on the 27th and 28th, but again lessened towards the last day. August having been in major part cloudy and wet, the range of temperature was not great—not exceeding seventeen degrees, and more usually only twelve or thirteen.

The first week of August had wet cloudy weather, and the wind was from the east, north-east, or south-ast

About the 8th, 9th, or 10th, the wind changed to west, or north-west, the clouds diminished, the air became drier, and the temperature kept steadily at a moderately high point. About the 19th or 20th the wind veered again to an easterly direction, the clouds increased, and rain during the latter ten days of the month was the rule. The break in the rains above noticed was very striking at Ajmere—all the rain excepting one inch fell in the first week, and after the 7th there was no more rain until the 30th.

The following table shows the total rain-falls for August of this and the three previous years :—

Stations.	1870.	1869.	1868.	1867.
Chukratta ...	11·77	4·07	9·17	...
Dehra ...	28·50	16·85	12·88	19·40
Roorkee ...	12·96	6·91	1·43	13·90
Meerut ...	8·16	3·39	0·20	18·37
Bareilly ...	8·55	5·58	0·60	10·60
Futtehgurh ...	11·75	4·02	3·51	...
Agra ...	7·05	2·50	1·30	11·10
Lucknow ...	18 36	5·52	3·70	4·90
Goruckpore ...	15·20	12·50	6·00	8 80
Ajmere ...	11·30	1·55	0·85	13·92
Allahabad ...	16·86	7·15	0·79	10·30
Benares ...	9·10	6·92	4·05	7·85
Jhansie ...	8·95	3·34	0·90	12·30

Some heavy rain-falls which occurred in twenty-four hours are here noted :—

At Chukratta, on 1st 1·70, and on 3rd 2·15; Dehra, on 11th 3·25, 14th 1·66, 17th 3·10, 20th 2·33, 21st 3·47, and 22nd 1·50; Roorkee, on 1st 2·70, and 27th 2·31; Meerut, on 2nd 1·40, 22nd 2·00, and 26th 1·50; Futtehgurh, on 24th 3·50, and 25th 3·70; Lucknow, on 6th 2·17, 10th 1·70, 23rd 1·63, 24th 4·75, and 25th 3·46; Goruckpore, on 21st 4·60, 23rd 3·70, and 26th 1·70; Ajmere, on 6th 7·40; Allahabad, on 2nd 2·42, 5th 1·47, 11th 2·55, 21st 2·30, and 23rd 3·40; Benares, on 1st 1·60; Jhansie, on 3rd 2·50, and on 6th 1·80.

SEPTEMBER.

Year.	Barometer.											
	Roorkee.		Agra.		Lucknow.		Goruckpore.		Ajmere.		Benares.	
	10	16	10	16	10	16	10	16	10	16	10	16
1870	28·852	28·768	29·162	29·064	29·390	29·286	29·474	29·361	28·135	28·065	29·472	29·381
1869	28·843	28·736	29·126	29·018	29·372	29·263	29·452	29·329	28·078	28·001	29·451	29·344
1868	28·838	28·743	29·160	29·054	29·396	29·286	...	...	...	...	29·469	29·368
1867	28·808	28·720	29·133	29·033	29·324	29·223	...	...	...	...	29·428	29·340

Year.	Thermometer.					Hygrometer.							
	Maximum in Sun's Rays.	Minimum on Grass.	Maximum in Shade.	Minimum in Shade.	Mean in Shade.	Dry.		Wet.		Difference.		Humidity.	
						10	16	10	16	10	16	10	16
1870	141	71	90	75	82	85	87	79	79	6	8	75	69
1869	143	73	91	74	83	85	87	79	80	6	7	78	73
1868	140	71	94	78	85	89	94	78	78	11	16	59	44
1867	117	75	88	79	84	86	89	79	80	7	9	68	64

The air-pressure was greater on an average by two-hundredths than last year, hardly one hundredth higher than 1868, and from four to five-hundredths higher than in 1867. Compared with August, the mean air-pressure was higher in September by twelve-hundredths. It was noticed in the report for August that the barometer had fallen rapidly on the last or second last day. This fall was continued into the first day of September, but there it stopped: for it suddenly and largely rose on the 2nd and 3rd, but immediately fell on the 4th and 5th, rising again on the 6th and 7th; it then fell on the 8th and 9th. A rise over a longer period now took place extending to the 15th, from which date it steadily fell to the 26th, and after that rose to the end of the month.

The temperature in the shade during the day rose from the beginning on to the 21st or 22nd, and then in all the stations a sudden fall took place, reaching its lowest point in some places on the 23rd, and in others on the 24th or 26th; after the latter date the temperature rose again. The temperature during the night did not show the same course, but remained with great steadiness all through the month; this was especially the case in the more easterly stations; in the others, a very slight decline from the first to the last day was the rule. The range of temperature was greater than in August, but it was still comparatively limited. It was greater in Allahabad, Benares, and Agra than at any of the other stations, especially those to the north and within a hundred miles of the Himalayas—like Meerut, Bareilly, and Goruckpore.

During the first eight days of September, and all over the North-Western Provinces and Oudh, rain fell, and the sky was fully overcast with clouds. After the 8th the rain ceased and the clouds broke up, and it remained fair in all the easterly stations till the 21st, 22nd, or 23rd; but in the westerly places there was a return of rainy weather some time between the 14th and 18th; but in these the rainy period subsequent to the 21st was slight. It was during these wet days that the depression of temperature above noticed

took place. It may be said that the rains were over by the 27th of September.

The following table gives the total rain-falls for September of this and the three preceding years:—

Stations.	1870.	1869.	1868.	1867.
Chukratta ...	6·24	10·30	2·52	...
Dehra ...	13·81	22·62	3·04	5·80
Roorkee ...	6·34	9·04	1·09	6·80
Meerut ...	3·95	3·83	0·10	1·40
Bareilly ...	12·95	19·91	4·30	7·70
Futtehgurh ...	6·90	9·72	5·11	...
Agra ...	0·56	12·10	0·17	1·20
Lucknow ...	17·16	13·16	8·12	8·10
Goruckpore ...	8·30	9·70	2·19	10·10
Ajmere ...	0·20	14·60	...	1·66
Allahabad ...	7·99	18·30	...	20·90
Benares ...	7·25	9·92	5·85	12·65
Jhansie ...	6·20	9·90	2·20	·640

The following heavy rain-falls are noted:—At Chukratta, on 2nd 2·45 inches; at Dehra, on 1st 2·35, on 2nd 2·35, on 7th 2·62, on 11th 1·43; at Roorkee, on 2nd 2·88, on 16th 1·48; at Meerut, on 2nd 2·30; at Bareilly, on 1st 8·50; at Futtehgurh, on 5th 1·40, and 16th 2·00; at Lucknow, on 1st 5·50, on 2nd 1·75, on 8th 1·40, on 22nd 1·90, and 24th 2·43; at Goruckpore, on 5th 1·90, and 11th 1·90; at Allahabad, on 23rd 2·50, and 24th 2·20; at Benares, on 12th 1·50, on 20th 1·80, and 24th 1·65; at Jhansie, on 2nd 2·30, and 24th 1·40.

OCTOBER.

Year.	Barometer.											
	Roorkee.		Agra.		Lucknow.		Goruckpore.		Ajmere.		Benares.	
	10	16	10	16	10	16	10	16	10	16	10	16
1870	28·985	28·892	29·298	29·196	29·544	29·427	29·620	29·497	28·257	28·194	29·618	29·523
1869	28 990	28·908	29·312	29·221	29·546	29·448	29·606	29·494	28·261	28·198	29·634	29·537
1868	29·095	28·938	29·348	29·248	29·591	29·490	...	...	...	...	29 66	29 575
1867	29·036	28·952	29·360	29.270	29·617	29 516	...	...	...	...	29·692	29 587

Year.	Thermometer.					Hygrometer.							
	Maximum in Sun's Rays.	Minimum on Grass.	Maximum in Shade.	Minimum in Shade.	Mean in Shade.	Dry.		Wet.		Difference.		Humidity.	
						10	16	10	16	10	16	10	16
1870	135	62	91	68	80	85	89	78	72	12	17	58	49
1869	136	58	87	64	76	81	85	71	72	11	13	62	54
1868	126	54	95	65	81	87	93	69	70	17	23	40	37
1867	117	59	88	65	80	83	86	71	71	12	15	54	46

The mean barometer readings were less in October, 1870, than in the same month of any of the three previous years. In each of the years there had been a fall, the amount of which was as follows:—Between 1867 and 1868, eighteen-thousandths, between 1868 and 1869, thirty-five-thousandths, and between 1869 and 1870 twelve-thousandths. The last statement is, however, not true for Goruckpore, where the mean readings were in excess this October as compared with last; in Ajmere, also, although there was a deficiency of pressure this year, it only amounted to four-thousandths.

Compared with September, the mean air-pressure in October was twelve-hundredths in excess. From the 26th up to the end of September the barometer was rising, and this rise continued up to the 3rd or 4th of October, but it fell on the 5th, and slightly recovered on the 6th, and then steadily rose to the 11th. A gentle but steady fall then ensued lasting to the 16th, whence there followed as gentle and steady arise till the 21st. A more rapid fall then succeeded extending to the 25th or 26th, and after that a sudden rise up to the 30th; but the 31st, except in Agra, showed a lower reading than the 30th.

The temperature fell from the 1st to the 20th, but this fall was more noticed in the night than in the day hours. The day temperature did not decline much until about the 17th or 18th, and especially was this the case in Bareilly, Futtehgurh, Agra, Lucknow, Allahabad, Benares, and Jhansie. The fall was more steady in the period named in Dehra, Roorkee, and Meerut. It should be noticed, however, that in almost all the stations there was a rise in the heat of the day on the 8th, 9th, or 10th—on one or other of these days, the highest temperatures being recorded. On the 21st, 22nd, or 23rd, there was a sudden fall of temperature extending to the 25th or 26th. This fall was seldom less than twenty degrees, it was, however, a more marked feature of the day than of the night; after the 26th the heat became greater, but

again this was less noticed in the night than in the day. The lowest day temperatures occurred on the 25th or 26th, but those of the night were less uniform occurring from the 18th on to the 29th.

The weather during the first twenty days of October was clear and dry, although still somewhat hot in the day time. About the 21st clouds began to gather, and a more or less overcast sky was the rule up to the twenty-ninth day. In this period rain fell in every station in the North-Western Provinces and Oudh; but in Seetapore, Futtehpore, Agra, and Ajmere, the rain was so slight as not to be measurable. In Allahabad and Nagode, on the other hand, the rain was excessive. The rain was rather more than one inch at all the places eastward of a line which would connect Bareilly and Jhansie, including these stations themselves. The fall of temperature above noticed was almost contemporaneous with the appearance of clouds, and the fall reached its maximum on the days of the heavy rain. The three or four last days of October were generally clear and cool. It was stated in the report for September that the rains were over by the 27th of that month, but that statement must now be qualified by what has been noticed above.

The following table exhibits the rain-falls for October in this and the three previous years :—

Stations.	1870.	1869.	1868.	1867.
Chukratta ...	·72	·77	...	...
Dehra ...	1·39	2·41	·05	...
Roorkee ...	·72	1·16	...	...
Meerut ...	...	·50	...	·70
Bareilly ...	1·15	3·50	...	...
Futtehgurh ...	...	3·85	...	...
Agra ...	...	3·70	...	1·02
Lucknow ..	2·44	4·11	...	6·20
Goruckpore ...	3·10	10·50	...	3·00
Ajmere ...	·40	·20	...	...
Allahabad ...	10·28	15·52	...	1·90
Benares ...	5·37	4·90	...	1·70
Jhansie ...	1·70	5·50	...	4·00

Rain-falls which exceeded one inch were observed at the following places and dates:—At Dehra, on 25th 1·39; at Bareilly, on 26th 1·00; Lucknow, on 23rd 1·27; Goruckpore, on 25th 1·00, and 26th 1·00; Allahabad, on 24th 3·85, on 25th 3·05, and 29th 1·44; Benares, on 25th 1·60, and 26th, 2·00; Jhansie, on 25th 1·50; Nagode, on 24th 5·50, 25th 2·30, and on 26th 1·80.

The following table exhibits the rain-fall at the more important stations for corresponding periods of the years 1867, 1868, 1869, and 1870, and also the total rain-fall for 1870:—

	Rain-fall from 1st June to 31st October.				Rain-fall from 1st January to 31st October.				Annual Rain-fall.
	1870.	1869.	1868.	1867.	1870.	1869.	1868.	1867.	1870.
Ch ukratta	45·78	27·71	11·65	...	57·22	40·28	...	...	57·22
Dehra ...	83·32	65·75	54·12	57·80	91·67	74·84	67·60	64·50	91·68
Roorkee	39·56	27·58	17·57	42·14	44·04	34·11	26·56	46·48	44·04
Meerut ...	34·14	15·57	11·09	38·63	37·67	18·97	...	43·14	42·16
Bareilly...	46·85	38·04	20·30	41·42	50·95	40·89	...	44·92	51·30
Futtehgurh	36·45	31·64	11·62	...	38·57	31·86	...	...	38·57
Agra ...	21·29	24·50	5·17	29·16	24·84	26·55	6·52	29·86	25·11
Lucknow	63·30	39·84	24·12	54·00	66·68	40·01	27·34	56·60	63·30
Fyzabad	77·30	58·80	33·40	66·80	80·20	61·00	37·32	75·16	80·20
Goruckpore	51·40	39·95	20·41	44·80	53·50	40·35	...	51·30	53·50
Ajmere...	22·60	21·00	8·33	23·95	22·85	23·75	9·75	25·45	23·25
Allahabad	56·10	40·97	11·09	51·80	57·82	40·97	...	54·10	57·82
Benares...	45·27	38·09	29·75	41·10	46·20	38·84	31·43	44·99	46·20
Jhansie...	28·00	58·57	14·50	55·20	29·00	59·87	23·20	55·60	29·00

General Remarks on the Rainy Season of 1870.

It has been already noticed that the year 1870 was much less abnormal on its general character than the two preceding years. This is especially true of the rainy season. The rains commenced at least a week earlier than in the preceding year, and continued with considerable uniformity

until the end of October. If the mean of the rain-falls given in the table may be taken as a rough approximation to the average rain-fall in the North-Western Provinces during the rainy season, we have—

				Inches.
Average fall for rainy season,		1870	...	45·5
Ditto	ditto	1869	...	41·3
Ditto	ditto	1868	...	22·1
Ditto	ditto	1867	...	48·91

The rainy season of 1870 differed little from that of 1869 in the amount of the rain-fall, but widely in its distribution. Thus, in 1869, the larger amount of the rain-fall in August and September, that of July being considerably less than that of other years.

In 1870, on the other hand, the rains were very fairly distributed throughout the whole of the season. The longest break, about three weeks, occurred in the month of October.

The humidity of the air began to increase rapidly about the 11th or 12th of June. Rain fell everywhere before the 18th. The chief breaks in the rains occurred in the middle of the months of August and September, and during the first three weeks of October..

THE LATTER COLD WEATHER.

THE latter cold weather includes the months of November and December.

NOVEMBER.

Year.	BAROMETER.																	
	Roorkee.		Agra.		Lucknow.		Goruckpore.		Ajmere.		Benares.							
	10	16	10	16	10	16	10	16	10	16	10	16						
1870 ...	29·116	29·001	29·453	29·347	29·679	29·583	29·757	29·640	28·350	28·303	29·772	29·682						
1869 ...	29·176	29·083	29·513	29·401	29·753	29·642	29·817	29·701	28·411	28·360	29·832	29·729						
1868 ...	29·125	29·047	29·465	29·362	29·726	29·604	...	...	...	...	29·792	29·690						
1867 ...	29·197	29·114	29·523	29·445	29·784	29·666	...	...	...	...	29·833	29·777						

Year.	THERMOMETER.				HYGROMETER.						
	Maximum in Sun's Rays.	Minimum on Grass.	Maximum in Shade.	Minimum in Shade.	Mean in Shade.	Dry.		Wet.		Difference.		Humidity.	
						10	16	10	16	10	16	10	16
1870	132	45	84	51	69	74	81	62	62	12	19	50	39
1869	130	42	82	50	67	72	88	61	63	11	25	51	41
1868	133	41	87	53	71	78	84	62	63	16	21	41	31
1867	113	47	80	54	73	75	81	62	64	13	17	47	38

The mean barometer readings for November, 1870, were less than for the same month in any of the preceding years. Between November, 1870, and 1869, the difference was sixty-thousandths less; 1870 and 1868, twenty-thousandths less; and between 1870 and 1867, ninety thousandths less. The readings in November, 1868, had been less than in either the preceding or succeeding year; but, as noted above, the air-pressure was even less in November of this year than it had been in 1868.

The barometer had stood a little lower on the 31st of October than it had on the 30th; this fall was continued into November, and lasted till the 6th, but it was very slight. After the 6th, a rise took place to the 9th, and then a more decided rise to the 13th; then ensued some fluctuation—falling on the 14th, rising on the 15th, falling again to the 18th; then followed a quick rise to the 20th, and as quick a fall to the 23rd; thence to the 25th, a very marked rise. On this day, the 25th, the barometer read its highest for the month at almost all the stations. After the 26th the barometer very slightly declined to the last day.

The temperature fell from the beginning to the end of November, both in the day and the night hours; but in the more eastern stations, as Goruckpore, Allahabad, and Benares, the decrease of heat was more marked at night than in the day. The temperature rather increased during the last two days.

There is but little to remark on the weather in November. There was no rain except at Allahabad, when a few drops fell on the 2nd. Clouds where observed in the eastern stations during the first six days, and again from the 21st to the 27th; but, as a rule, the sky was clear. The wind in the more westerly stations was either still altogether, or only blew in slight breezes from the west or north-west. In the more easterly places, the wind was often from the north and east, but calm days also prevailed.

DECEMBER.

BAROMETER.

Year.	Roorkee.		Agra.		Lucknow.		Goruckpore.		Ajmere.		Benares.	
	10	16	10	16	10	16	10	16	10	16	10	16
1870	29·175	29·090	29·525	29·412	29·752	29·646	29·825	29·704	28·385	28·334	29·845	29·749
1869	29·160	29·084	29·500	29·396	29·778	29·643	29·796	29·689	28·401	28 333	29·824	29·723
1868	29·211	29·116	29·541	29·430	29·812	29·693	29·860	29·743	28·449	28 380	29·880	29 772
1867	29·244	29·157	29·580	29·473	29·826	29·710	...	...	28·452	28·402	29·918	29·812

THERMOMETER. HYGROMETER.

Year.	Maximum in Sun's Rays.	Minimum on Grass.	Maximum in Shade.	Minimum in Shade.	Mean in Shade.	Dry.		Wet.		Difference.		Humidity.	
						10	16	10	16	10	16	10	16
1870	124	39	76	40	60	64	73	56	59	8	14	54	43
1869	121	39	76	47	62	65	72	56	60	9	12	58	56
1868	122	35	73	47	63	67	76	56	59	11	17	52	44
1867	99	41	72	48	63	65	72	57	60	8	12	62	51

The barometer stood about two-hundredths of an inch higher this December than in the corresponding month of the preceding year, but from six to seven-hundredths less than in the same month of 1867. The mean air-pressure during the present month was everywhere considerably higher (from six-hundredths to seventy-five-thousandths) than in November. According to the last report, the barometer was slightly falling towards the end of the month. For the first five days of December there was a slight and gradual increase, and after this the barometer fell for several days, until the 12th or 13th. A rise of from one-tenth to fifteen hundredths occurred on the 14th and 15th; and after this a continuous depression followed until the 21st, on which day, at nearly all the stations, the lowest readings of the month were observed. The fall during this interval was nearly three-tenths of an inch. A rise of about as much took place in the next four days, so that the readings on the 25th were nearly as high as on the 15th. From the 25th to the end of the month the air-pressure fell, until the readings on the last day were very nearly as low as on the 21st.

The general tendency of the thermometrical readings was to fall until the middle of the month and then rise to the end. A gradual fall took place until the 5th or 6th, after which a slight rise followed during the 7th, 8th, and 9th.

From this date until the 15th or 16th the temperature fell, and on one of the above two days the mean temperature of the day was the lowest of the month at all stations. After this it gradually rose during the remainder of the month, with the exceptions of slight falls which occurred about the 22nd and on the 28th.

The weather during the greater part of the month was, throughout the whole Province, clear, cold, and pleasant.

Clouds began to form about the 22nd, and in the majority of stations cloudy weather continued until the end of the month. There was every appearance of rain on the 28th and 29th, but none fell, except at the three stations of Ajmere (where four-tenths of an inch was registered), Bareilly, and Ranee khet.

Hourly Observations taken at Roorkee.

Hours from 1 A. M.	21st March, 1867.	20th March, 1868.	21st March, 1868.	21st March, 1869.	22nd March, 1869.	21st March, 1870.	22nd March, 1870.	21st June, 1867.	20th June, 1868.	21st June, 1868.	21st June, 1869.	22nd June, 1869.	21st June, 1870.	22nd June, 1870.	21st Sept., 1866.
1	28·872	28·934	29 001	28·877	28·900	29·041	28·995	28 600	28·547	28·624	28·595	28 538	28·667	28·649	28·853
2	28·811*	28·933	28·999	28·853*	28 894	29·021	28·991	28·591	28·547	28·594	28·533	28·525	28 672	28·646*	28·851
3	28·858	28·913	28 974	28·864	28 886	29·016	28·962	28·575	28·545*	28·552	28·533	28·489	28·660	28·651	28·339
4	28·855	28·894*	28·959	28·882	28·882*	28 998*	28·954	28 572*	28·553	28·590	28·505	28·516	28·654*	28·649	28 835
5	28·854	28·922	28·956*	28·885	28 886	28·998*	28·943*	28·597	28·604	28·600	28·489	28·483	28·658	28·658	28·821*
6	28·872	28·931	28·987	28·906	28 918	29 029	28·957	28·610	28·606	28·598	28·480*	28·473*	28·666	28·660	28·837
7	28·892	28·968	28 988	28·920	28·946	29 033	28·970	28 629	28·635	28·633*	28·481	28·482	28·678	28 683	28·855
8	28·950	29·013	29 024	29·009	28·987	29 039	28·992	28·627	28·542	28·636	28·488	28·487	28·682	28·704	28·861
9	28·973	29·030	29·050	28·931	29·019	29 023	28·999	28·634	28·640	28·652	28·505	28·496	28·692	28·705	28·870
10	28·957	29·032	29·071*	28·930	29 043	29·068	29 014*	28·659*	28 649	28 656	28·516	28·504	28·702*	28·708	28·904*
11	28·962*	29·032	29 070	28·930	29 056*	29·069*	29·006	28·646	28·957*	28 660	28 526	28 520	28 690	28 750*	28·868
12	28·941	29·035*	29 050	28·982*	29·055	29·060	29·002	28·652	28 651	28·653	28·531*	28·524	28·686	28·697	28 863
13	28·913	29·020	29 034	28 894	29·044	29·058	28 990	28·648	28·634	28·647	28·526	28 533	28 673	28·691	28·850
14	28·882	28·972	29·064	28 867	29·030	29 012	28 947	28·628	28 611	28·634	28·526	28·534*	28 650	28 672	28·826
15	28 852	28·953	29 031	28·839	29·015	29·009	28 927	28·606	28.603	28·606	28·510*	28·534	28·632	28 646	28·808
16	28·836	28 946*	29 054	28 841	29 007	28 990	28 915	28·583	28·601	28·558*	28·530	28 533	28·598	28·632	28·798
17	28·827*	28 946*	29 022	28 860	28·993	28·973*	28 898	28·578	28·593*	28·578	28 531	28·547	28·590	28 610	28·791
18	28·833	28·962	29·024	28·880	28·986	28·992	28·887*	28·569*	28·627	28·577	28·536	28·553	28·574*	28 591*	28·792*
19	28·842	28·981	29 019*	28 879*	28·995*	28 987	28·910	28 568*	28 632	28·591	28·559	28·557	28 626	28·600	28 790*
20	28·872	28·988	29·019*	28·891	29 011	28·989	28·921	28 589	28 628	28 584	28·563	28·560	28·583	28 602	28·818
21	28·879	29·006	29 081	28·906	29·014	29·010	28 935	28·617	28 632	28 636	28 582	28·565*	28·610	28·636	28·827
22	28·886*	29·008	29·129	28 916*	29·029	29·015	28·952	28 626	28 628	28 624	28 590*	28 555	28·631	28 636	28.826
23	28·883	29·035	29·124	28·910*	29·033*	29·020	28·967	28·590	28.656*	28·646*	28·580	28·552	28·635	28·638	28·841*
24	28·880	29 038	29·283*	28 902*	29·033	29·025	28 984	28·639	28·448	28·569	28·569	28·532*	28·653*	28·668*	28·839

Hourly Observations taken at Roorkee.

Hours from 1 A. M.	23rd September, 1867.	22nd September, 1868.	23rd September, 1868.	21st September, 1869.	22nd September, 1869.	21st September, 1870.	22nd September, 1870.	20th December, 1866.	22nd December, 1867.	21st December, 1868.	22nd December, 1868.	21st December, 1869.	22nd December, 1869.	21st December, 1870.	22nd December, 1870.
1	28·831	28·767	28·811	28·821	28·794	28·752*	28·772	29·307	29·141	29·141	29·119	29·107	29·176	28 934	28·962
2	28 827	28·755	28·782	28 811	28 790	28·765	23·770	29·293*	29·133	29·140	29·111	29·102	29·171	28 934	28·951
3	28·816*	28·735	28·755	28·808	28·796	28·765	28·778	29·294*	29·127	29·137	29·093	29·090	29·173	28 935	28·949*
4	28·818*	28·727*	28·736	28·808	28·786	28·759	28·761	29·294*	29·125*	29·133	29·082	29 075*	29·166	28 935	28·957
5	28 816*	28·732	28·727	28 885*	28·785*	28·767	28·763	29·297	29·126	29 132	29·060	29 080	29·156*	28·904*	28 968
6	28·836	28 762	28·728	28·843	28·812	28·790	28·775	29·308	29·128	26·128*	29·077	29·098	29·156*	28·907	28·259
7	28·851	28·778	28·722*	28 847	28·833	28·814	28·784	29·332	29·150	29·158	29·072	29·120	29·180	28·918	28·979
8	28·873	28·788	28·734	38 850	28 859	28·838	28·787	29·357	29·178	29·184	29·077	29 156	29·203	28·931	29·022
9	28 884	28·815	28·736	28·849	28·855	28·853	28·792	29·398*	29·201	29·198	29·094	29·143	29·220	28·937	29·302
10	28·898*	28·823	28·740	28·864	28·869*	28 853*	28·805	29·395	29·225*	29 206*	29·127*	29·202*	29·220	28·964	29·050*
11	28·891	28 832*	28·746*	28·875*	28·854	28·858*	28 800	29·384	29·213	29·300	29·115	29·185	29·221*	28·959	29 039
12	28·892	28·829	28·736	28 851	28·842	28·788	28·790	29·350	29·196	29 186	29·106	29·187	29·194	29·048*	29 024
13	28·883	28·829	28·737	28·835	28 799*	28·806	28·771	29·321	29·125	29·153	23·078	29 166	29·171	28·921	29 016
14	28·864	28·830	28·737	28·877	28·761	28 774	28·732	29·296	29·118	29 141	29·054	29·164	29·156	28·907	29·006
15	28·834	28·828	28·733	28·742	28·767	28·729	28·718	29·277	29·106	29·118	29·044	29 146	29·144	28·895	28·991*
16	28·828	28·831	28 727*	28·715	28·763	28·713	28·697	29·272	29·091*	29·108*	29·038*	29·139	29·142*	28·892*	29·004
17	28·814*	28·826*	28·736	28·695	28·760*	28·709*	28·689*	29·289	29·094	29 112	29·038*	29·137*	29·143	28·906	29·007
18	28·834	28 842	28·753	28·692	28·765	28·720	28·698	29·263*	29·111	29·118	29 042	29·142	29 150	28·912	29 037
19	28·838	28 844	28·780	28·708	28·786	28·734	28·708	29·264*	29·119	29·123	29·048	29·151	29·157	28·942	29·064
20	28·858*	28·841	28·803	28·740	28·773	28·741	28·746	29·282	29·137	29·133	29·070	29·169	29·164	28 942	29·064
21	28·855	28·847	28 816*	28·763	28·785	28·750	28·762	29·292	29·149	29·144	29 082	29·185	29·177	28·959	29·084
22	28·856	28·841	28 814*	28·796	28·806	28·758	28·778	29·310*	29·164	29·150	29·081	29·196*	29·185	28·975	29 088
23	28 850	28·855*	28·808	28·798	28·826	28·765	28·782*	29·303	29·172*	29·147	29·084*	29·103	29·194*	28·974	29 092*
24	28·850	28·843	28·809	28·801*	28·830	28·776*	28·776	29·298	29·154	29·131	29·081*	29·186	29·188	29·030*	29 080

TABLE SHOWING SOME MEAN RESULTS OF OBSERVATIONS AT ROORKEE FOR SEVEN PRECEDING YEARS.

Lat. 29° 52′ *N.*; *Lon.* 77° 57′ 15″ *E.*; *Height above Sea,* 880 *feet.*

Year.	Barometer.			
	10	16	Highest monthly mean.		Lowest monthly mean.	
			10	16	10	16
1864	28·944	28·861	Nov., 29·211	Nov., 29·121	July., 28·641	July, 28·550
1865	28·975	28·857	Jan., 29·503	Jan., 29·125	July, 28·656	July, 28·571
1866	28·944	28·851	Dec., 29·215	Dec., 29·128	June, 28·633	June, 28·543
1867	28·955	28·942	Dec., 29·242	Dec., 29·157	July, 28·677	July, 28·605
1868	28·951	28·866	Dec., 29·211	Dec., 29·116	June, 28·678	June, 28·581
1869	28·944	28·853	Jan., 29·202	Jan., 29·112	June, 28·632	June, 28·532
1870	28·916	28·827	Dec., 29·175	Dec., 29·090	July, 28·583	July, 28·559
Mean of seven years ...	28·947	28·865	29·251	29·122	28·653	28·563

TABLE SHOWING MEAN RESULTS OF OBSERVATIONS AT DEHRA FOR THREE PRECEDING YEARS.

Lat. ... *N.*; *Lon.* ... *E.*; *Height above Sea,* 2,232 *feet.*

1868	27·624	27·512	Dec., 27·838	Dec., 27·757	June, 27·387	June, 27·305
1869	27·616	27 527	Jan. 27·824	Jan., 27·735	June, 27·357	June, 27·265
1870	27·599	27·509	Dec., 27·817	Dec., 27·722	July, 27·349	July, 27 277
Mean of three years ...	27·613	27·516	27·826	27·738	27·364	27·281

TABLE SHOWING SOME MEAN RESULTS OF OBSERVATIONS

Lat. 29° 52′ *N.*; *Lon.* 77° 57′ 15″

Year.	Hygrometer—Humidity of Atmosphere—Saturation=100.						Maximum monthly mean (day).	Minimum monthly mean (night).
	10	16	Highest monthly mean.		Lowest monthly mean.			
			10	16	10	16		
1864	58	44	Aug., 80	Aug., 74	April, 35	April, 25	89	60
1865	61	52	Aug., 78	Aug., 75	April, 45	April, 36	89	62
1866	56	46	Jan. & Aug., 80	Aug., 78	May, 24	May, 19	89	62
1867	54	44	July, 79	Aug., 77	May, 29	May, 19	87	62
1868	53	41	Feb., 72	Feb., & July, 55	April, May, & Oct., 35	May, 25	88	63
1869	57	45	Sept., 76	Sept., 71	April, 81	May, 17	88	63
1870	53	42	July, 77	July, 67	May, 230	May, 15	88	62
Mean of seven years ...	56	45	77	71	32	22	88	62

TABLE SHOWING MEAN RESULTS OF OBSERVATIONS

Lat. *N.*; *Lon*

1868	60	51	Feb. & July, 73	July & Aug., 67	May, 42	Nov., 33	82	58
1869	60	50	Sept., 84	Aug. & Sept., 77	May, 30	May, 24	80	60
1870	61	51	July, 86	Aug., 85	May, 32	May, 23	81	60
Mean of three years ...	60	51	81	76	35	27	81	59

AT ROORKEE FOR SEVEN PRECEDING YEARS.

E.; Height above Sea, 880 feet.

Thermometer in Shade.				Rain.		Wind—Number of days it blew in certain directions.								
Highest maximum. Day.	Lowest maximum. Day.	Highest maximum. Night.	Lowest maximum. Night.	Number of days on which it fell.	Total fall.	N.	N.-E.	E.	S.-E.	S.	S.-W.	W.	N.-W.	Calm.
June, 109	Jan., 70	July, 79	Jan., 40	45	31·90	4	21	4	83	8	19	...	64	172
June, 107	Dec., 71	June, 79	Jan., 44	53	59·49	4	7	13	94	3	2	...	40	209
May, 106	Jan., 67	June, 80	Dec., 40	44	31·36	3	6	21	106	1	1	1	67	259
May. 102	Dec., 71	July, 77	Dec., 44	70	47·53	5	32	12	90	20	19	22	34	132
May, 101	Jan., 69	June & Aug., 80	Jan. & Dec., 44	47	26·68	1	25	7	89	18	35	41	20	129
May, 110	Jan., 71	June, 82	Dec, 43	57	35·11	1	15	7	39	7	17	66	86	127
May. 107	Jan., 73	June, 80	Jan., 41	59	44·04	6	14	24	135	2	8	13	64	99
106	70	79	42	54	38·3	3	...	...	...	...	...	...	...	...

AT DEHRA FOR THREE PRECEDING YEARS.

E.; Height above Sea, 2,232 feet.

May, 93	Jan.. 65	June, 73	Jan., 41	90	57·78	11	5	8	18	36	50	54	40	144
May, 99	Jan., 68	June, 77	Jan. & Dec., 44	103	75·82	4	0	9	6	33	61	38	15	199
May, 97	Jan., 68	June, 76	Jan., 43	109	91·67	4	4	3	6	38	73	42	13	182
96	67	75	43	101	75·09	6	3	7	10	36	61	45	22	175

TABLE SHOWING SOME MEAN RESULTS OF OBSERVA

Lat. 27° 10′ *N.*; *Lon.* 78° 5′

Year.	Barometer.					
	10 A. M.	4 P. M.	Highest monthly mean.		Lowest monthly mean.	
			10 A.M.	4 P. M	10 A.M.	4 P. M.
1865	29·295	29·204	Dec., 29 594	Dec., 29 363	June, 28 934	June, 28·859
1866	29·274	29·171	Dec., 29 584	Dec., 29·445	July, 28·997	June, 28·885
1867	29·297	29 195	Dec., 29 580	Dec., 29·473	July, 29·012	Aug. 28·874
1868	29·279	29·176	Dec., 29 541	Dec., 29,430	June,& July 28 996	June, 28·898
1869	29·258	29 154	Jan., 28·526	Jan., 29 428	June, 28·938	June, 28·833
1870	29 238	29·134	Dec., 29·525	Dec., 29·412	July. 39·058	July, 28·840
Mean of six years	29 273	29·172	29·558	29·457	28 986	28·865

TABLE SHOWING SOME MEAN RESULTS OF OBSERVATIONS

Lat. 25° 2′ *N.*; *Lon.*. 83° 5′ *E.*;

1864	29·664	29·561	Jan., 29 964	Dec., 29·824	July, 29 336	July, 29·253
1865	29·665	29·573	Jan., 29 933	Jan., 29·851	June, 29·359	July, 29·249
1866	...	...	...	...	...	...
1867	29·627	29·535	Jan., 29·940	Jan., 29 852	July. 29·288	July, 29·220
1868	29·602	29 507	Dec., 29·880	Jan., 29·840	June,& July. 29·325	June, 29·224
1869	29·588	29·480	Jan., 29·876	Jan., 29 770	June, 29·263	June, 29·167
1870	29·557	29 465	Dec., 29 845	Dec., 29·749	July, 29 270	July, 29·183
Genl. mean of six years	29·617	29·520	29 906	29·815	29·307	29·216

TIONS AT AGRA FOR SIX PRECEDING YEARS.

E.; *Height above Sea, 551 feet.*

Hygrometer—Humidity of atmosphere—Saturation=100.						Thermometer in Shade					
10 A. M.	4. P. M.	Highest monthly mean.		Lowest monthly mean.		Maximum monthly mean (day).	Minimum monthly mean (night).	Highest maximum.	Lowest maximum.	Highest maximum.	Lowest maximum.
		10 A.M.	4 P. M.	10 A.M	4 P. M			Day.		Night.	
71	58	Aug., 88	Aug., 79	April, 38	April, 28	92	67	June, 111	Dec., 74	June, 86	Jan., 47
81	61	Oct., 90	Aug., 78	Dec., 67	April, 42	91	64	May, 111	Jan., 70	June, 85	Dec., 43
58	51	July, 72	July, 70	May & Novr., 45	Nov., 32	94	66	June, 111	Dec., 73	June & Aug 81	Jan., 46
49	35	Aug., 65	July & Aug., 51	May, 29	May, 19	90	67	May, 105	Jan., 69	July, 83	Jan., 45
55	43	Sept., 81	Sept., 78	May, 23	May, 17	88	69	May, 112	Feb, 71	June, 90	Jan., 49
54	41	Aug., 78	Aug., 70	May, 25	May, 16	89	67	May, 108	Jan., 72	June 84	Jan., 46
53	40	79	71	38	15	91	66	110	71	85	46

AT BENARES FOR SEVEN PRECEDING YEARS.

Height above Sea, 260 feet.

47	39	Sept., 69	Aug., 63	Mar., 31	Mar, & Apl., 25	...	...	...	...	...	...
55	45	July, 71	July, 76	April, 38	April, 28	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...
58	51	July, 74	Aug. & Sep., 68	Mar., 40	Mar., 29	...	...	...	...	...	...
...	...	Jan., ...	Sept., ...	May, ...	May, ...	...	...	May, ...	Dec., ...	July, ...	Dec., ...
50	45	July & Sep., 73	Sept., 78	April, 25	April, 17	94	64	May, 114	Jan., 78 Jan.&	June, 82	Jan., 42
53	47	July, 76	July, 76	May, 27	May, 18	94	61	May. 111	Decr., 78	June, 78	Dec., 40
53	45	72	72	32	24	...	...	...	...	...	...

TABLE SHOWING SOME MEAN RESULTS OF OBSERVATIONS AT AGRA FOR SIX PRECEDING YEARS.

Lat. 27° 10′ *N.*; *Lon.* 78° 5′ *E.*; *Height above Sea*, 551 *feet.*

Year.	Rain.		Wind.								
	Number of days on which it fell	Total fall.	N.	N.-E.	E.	S.-E.	S.	S.-W.	W.	N.-W.	Calm.
1865	42	26·60	14	16	47	11	15	11	122	12	117
1866	36	23 93	3	6	33	6	2	7	158	7	148
1867	72	30·36	38	49	42	35	41	41	59	71	6
1868	27	17·52	44	40	48	43	40	46	48	35	22
1869	43	27·35	...	...	...	...	...	...	...	...	...
1870	49	25·11	15	27	39	41	17	47	181	51	27
Mean of six years, ...	43	25·14	23	28	42	38	22	31	98	36	53

TABLE SHOWING SOME MEAN RESULTS OF OBSERVATIONS AT BENARES FOR SEVEN PRECEDING YEARS.

Lat. 25° 2′ *N.*; *Lon.* 83° 5′ *E.*; *Height above Sea*, 260 *feet.*

1864	35	14·77	4	14	41	39	10	60	117	35	...
1865	56	41·67	2	21	62	35	10	31	113	47	21
1866	...	...	...	...	...	...	...	...	...	...	...
1867	57	44·99	22	10	86	10	14	44	119	9	27
1868	44	31·43	22	33	65	14	10	39	130	34	19
1869	56	38·87	23	31	96	15	13	23	87	52	21
1870	59	45·27	12	21	82	16	37	34	122	25	16
Genl. mean of six years,	51	3 6·16	12	22	72	21	16	38	114	35	21

Art V.

RETURNS OF VACCINATION, N.-W. PROVINCES, FOR 1870-71.

[No. I.]—*Report by* W. WATSON, ESQ., M.B., *Offg. Superintendent-General of Vaccination, North-Western Provinces, No.* 62, *dated Almorah, 8th May*, 1871.

I HAVE the honour to submit, for the information of his Honor the Lieutenant-Governor, the Returns * of Vaccination for the North-West Provinces for the year 1870-71, showing a total of 242,614 successful cases of primary vaccination.

2. The strength of the vaccine establishment was:—1 Superintendent-General, 4 European Superintendents (including the Superintendent of Ajmere), 1 Deputy Superintendent, 37 Native Superintendents, and 188 Vaccinators, paid by Government; besides this, there were 46 Municipal Vaccinators, 13 Local Vaccinators, and 37 Vaccinators paid by Native Chiefs.

3. Great difficulties have been experienced this year in the Vaccine Department owing to the introduction of the new postal rules. Vaccinators are still allowed to frank letters to a European Superintendent, but in former years any vaccinator was allowed to frank a letter to any other vaccinator working within the limits of the same zillah. As long as they enjoyed this privilege, any vaccinator who had a superfluity of lymph was in the habit of sending supplies to his neighbours who had a deficiency; and in this way, if any vaccinator in a zillah established a good vesicle in the first week in November, all the others in the zillah were able to do so by the second or third week at latest.

In order to obviate the difficulty attending the abolition of the district dâk, and to enable the vaccinators to commu-

* Not printed.

nicate with each other, I obtained the permission of Government to purchase and issue service-stamps; but the system was a new one, and not properly understood.

The consequence of this was, that in most districts the vaccinations during the months of November and December were far fewer than they generally are in these months. In Rohilkhund, in November and December, 1869, there were 26,965 vaccinations, while in November and December, 1870, there were only 18,466.

I propose next year to supply each vaccinator with twenty-four service-stamps for the month of November, and with six stamps for each of the succeeding months. The Native Superintendents will be supplied in a similar scale, so as to enable them to reply to the letters received from their vaccinators.

4. The average cost of each successful operation has for some years past been higher in the North-Western Provinces than in any other province of the Bengal Presidency, and the same will probably be the case this year. This is principally owing to the absence of dispensary vaccination, that is to say, vaccination superintended, not by the officers of the Vaccine Department, but by the Civil Surgeons of zillahs, whose pay is not drawn in the Vaccine Department. This system has many advantages, but it is open to the objection of throwing additional work on Civil Surgeons, whose time is already fully occupied, and it makes the Vaccine Department responsible for work which they have no opportunity of superintending.

In very small stations where the Civil Surgeon has comparatively little to do, the dispensary system might be tried with advantage, but in all large stations I think that the plan adopted in the North-Western Provinces, of placing the vaccinators under the superintendence of a separate department, is on the whole the best.

5. During the past year, the following supplies of crusts and tubes were sent from the Kumaon Depôt :—

	Crusts.	*Tubes.*
To the Superintendent, Allahabad, ...	1,724	924
,, ,, Benares, ...	2,214	580
,, ,, Ajmere, ...	906	112
,, Depy. Supdt., Rohilkhund, ...	838	768

The following medical officers also applied for and received supplies :—

Depy. Inspr.-Genl. of Hospitals, Meerut.
Ditto ditto, Dinapore.
The Suptdg. Surgeon-Major, Allahabad.
The Civil Surgeon, ... Ditto.
Ditto, ... Nursingpore.
Ditto, ... Gya.
Ditto, ... Ranchee.
Ditto, ... Jubbulpore.
Ditto, ... Seebsagur.
The Medical Officer, ... Marwar.
Ditto, ... 42nd Assam Light Infantry
Ditto, ... Malwa Bheel Corps.
Ditto, ... 2nd Goorkhas.
Ditto, ... 105th Light Infantry.
Ditto, ... 103rd Regiment.
The Agency Surgeon, ... Jeypore.
Ditto, ... Bhurtpore.
Ditto, ... Oodeypore.
Supdt. of Vaccination, ... Lucknow.
Ditto, ... Central Provinces.
Ditto of Lunatic Asylum, Calcutta.
The Native Doctor, ... Serohee Dispensary.
Ditto, ... Pallee Dispensary.
Ditto, ... Jalra Patun Dispensary.

The Native Doctor,	... Kotah Dispensary.
Ditto,	... Tonk Dispensary.
Ditto,	... Indurgurh Dispensary.

In all, 16,550 crusts and 3,642 tubes were sent to the plains from the depôt.

This is exclusive of 500 English tubes which were received on the 22nd September, 1870, from the Medical Officer, Privy Council, and which were occasionally sent to medical officers when applications were specially made for English lymph. These English tubes, though generally of excellent quality, were in my opinion somewhat inferior to the Kumaon ones. As an experiment, I vaccinated five English children as follows:—Each child was vaccinated on the right arm with English lymph, and on the left arm with Kumaon tube-lymph. In four of the five cases the Kumaon lymph took, whereas the English lymph was only successful in two instances.

In one case both were unsuccessful, and the child was then vaccinated with fresh lymph taken from the arm of a Native child. This was perfectly successful on both arms, illustrating the well-known fact that tube-lymph, however good it may be, is never quite equal to fresh lymph.

6. In the month of November, I was asked by Doctor Harvey, Civil Surgeon of Eastern Rajpootana, to send some vaccinators who had been trained under Doctor Pearson, in order to commence vaccination in the Native State of Ulwar. I accordingly selected a Native Superintendent and 8 vaccinators, and sent them to Bhurtpore, Doctor Harvey's head-quarters. I have since heard from him that he is pleased with the men who were sent to him.

7. During the past year Government sanctioned the expenditure of Rs. 500 for the purpose of teaching vaccination to hakeems, baids, and inoculators. Of this amount

Rs. 50 was spent in Kumaon, where there are still many men who formerly practised inoculation; Rs. 100 was sent to the Superintendent of Allahabad, who, however, as stated in para. 33 of his report, has not spent any part of it; and the balance, Rs. 350, was assigned to the Benares Circle, of which Rs. 300 have been spent: so that in all Rs. 150 still remains to the credit of Government.

As I have mentioned in previous reports, great difficulties attend the distribution of money to hakeems and baids, as the better class of Native physicians will not condescend to practise the manual art of vaccination.

Dr. Richardson tried to induce two baids to learn vaccination—one at Lullutpore, and the other at Kurraree—and offered to pay them a regular salary; but neither of them would do any real work. One hakeem, Sham Lall, of Allahabad, applied for an allowance from the Hakeem Fund on the ground that his father was a distinguished hakeem, and that he himself practised medicine in Allahabad. He evidently misunderstood the purpose for which the fund was sanctioned, and on being informed that to entitle him to a share of the allowance he must learn vaccination, he declined to do so.

One man, named Ram Narain, in the zillah of Jounpore, learned vaccination; but as the vaccinator at Muchlishuhur was ill last winter, Ram Narain was appointed to act for him, and drew pay as a vaccinator, so that nothing was given to him from the Hakeem Fund, as would have been done had this vacancy not occurred.

With regard to the education of inoculators, Dr. Milne gives most favourable reports of his success in the Benares Circle, the only one, except Kumaon, in which inoculators are found in any great numbers, though there are a few in the district of Jounpore in the Allahabad Circle.

In the budget for the ensuing year Rs. 500 has been entered for inoculators and Rs. 500 for hakeems, and I would recommend that the whole of the Rs. 500 for inoculators should be assigned to the Benares Circle, and that the Rs. 500 for hakeems should be divided equally between the five circles of the North-Western Provinces.

8. During the summer of 1870 I inspected all the vaccinators in Gurhwal, while those in Kumaon were inspected by Doctor Milne.

In the Hills vaccination is carried on all the year round. During the hot months the vaccinators work in the high regions near the snows, and during the winter in the lower hills and in the Terai.

In the upper regions the difficulties of inspection are considerable, as the distance from the headquarters station of one vaccinator to that of another is seldom less than a week's march. After arriving at the vaccinator's headquarters, it is of course necessary to accompany him to the several villages in which he has vaccinated children, and as a general rule this can only be done on foot, as it is impossible to take even a hill-pony along the precipitous paths leading from one village to another.

Owing to the great distance between the villages, the amount of work done by each vaccinator during summer is very small; but the tubes and crusts collected near the snowy range are very much better than those collected in the lower hills of Kumaon.

The success of vaccination in this Commissionership is to be judged of, not by the number of reported cases, but by the quantity and quality of the lymph which it has for seventeen years past supplied annually to the plains.

It may also be noticed that the districts of Kumaon and Gurhwal have been for many years an example of a large

tract of country in which vaccination has afforded absolute protection against small-pox.

In my last annual report I mentioned that for several years small-pox had been unknown in the Kumaon and Gurhwal hills. This is still true with regard to the interior, but, unfortunately, soon after my report was written, several cases of small-pox occurred in the military station of Raneekhet and in the adjoining district of Atagowlie.

The infection was brought up from the plains by the numerous coolies who came to work at Raneekhet, and on the new cart-road leading from Raneekhet to Ramnugger.

A vaccinator was immediately posted to Raneekhet, and continued to work in the station, and in the country around, during the whole of the past summer, and a similar arrangement will be made this year.

The rise of this new station has greatly increased the amount of work to be done in Kumaon, and the work has also been increased by the influx of plains-men who have recently settled in the Bhabur and Terai, many of whom have never been vaccinated. Under these circumstances, I am of opinion that an increase to the Kumaon vaccine establishment is required. The existing arrangements were made many years ago, and at a time when the population was very much less. I would recommend that two additional vaccinators should be allowed, and that they should be posted during winter, one at Kotwara and the other near Hurdwar; they would work during summer, one at Raneekhet and the other at Nynee Tal. I make this recommendation on the supposition that it is intended to form a large military station at Raneekhet.

Owing to the appearance of small-pox at Raneekhet, secondary vaccination was extensively practised in Kumaon during the summer of 1870, and this has greatly increased the total number of persons vaccinated.

10845y

Should an outbreak of small-pox not occur this year, the practice of secondary vaccination will not be continued to the same extent, and in that case the total number of persons vaccinated will be less in next year's report than they are in the present one.

9. During winter I inspected all the vaccinators in the Rohilkhund Circle with the exception of one man stationed in the Shahjehanpore Zillah, whose work I had seen in March 1869, and also in February, 1870.

The vaccination which I saw in Rohilkhund was on the whole most satisfactory, and highly creditable to the Deputy Superintendent, Baboo Bunda Deen, who, owing to the illness of Dr. Pearson, has for the last two or three years had almost the entire management of the Rohilkhund Circle. I was particularly pleased with the work of the municipal vaccinators of Moradabad and Shahjehanpore, and with that of the Government vaccinators of Beharee, Sahuswan, Bijnour, Datagunj, and Gunnour. I found the work unsatisfactory in only two places, in the town of Chandpore and in the city of Bareilly. In Chandpore, the vaccinator had left in consequence of illness, and a substitute was acting for him. This substitute showed me forty cases which he called successful, and they were all successful to a certain extent, that is to say, in all a vesicle had appeared on the child's arm; but among the whole forty there was not a single really good case. It was doubtful whether any of the cases were efficiently protected against small-pox, and, at all events, it is certain that in no one case was there any lymph good enough to be used for the purpose of vaccinating other children. This man had been working most industriously, but, owing to want of judgment and care in selecting cases, his lymph had degenerated, and would soon have failed altogether. That the lymph had originally been of good quality was proved by an examination of the vaccine-crusts, and of the cicatrices of vaccination on the arms of children who had been vaccinated a month previously by the vaccinator for whom he was acting.

This occurrence illustrates the necessity of constant and careful supervision, and explains the circumstance, which at first sight appears anomalous enough, that one result of efficient superintendence is to diminish the reported number of successful cases. This occurs in two ways : in the first place, in the absence of efficient supervision, there will probably always be a certain number of vaccinators dishonest enough to send in reports which they known to be false, entering as successful cases which they have never vaccinated at all. This swells the column of total numbers vaccinated, as well as of successfully vaccinated. In the second place, there is a still larger number of vaccinators, who, without being absolutely dishonest, are far too easily satisfied with the result of their operations. Such men enter all their doubtful cases as successful, and in this way they have a large percentage of successful cases as compared with unsuccessful ones.

With regard to the city of Bareilly, I found myself unable to account for the bad success of vaccination. The vaccinators seemed to be active and industrious men, and had been judiciously selected, as one was a Brahmin and the other a Mussulman. They were highly spoken of by the Civil Surgeon, Doctor Corbyn, and appeared to be popular in the city.

Many of the leading Hindoo gentlemen, such as Rai Bukhtawur Singh, Subordinate Judge, Pundit Ajoodhia Pershad, Deputy Collector, and Luchmi Narain, banker, took great interest in the cause of vaccination. In spite of all this, the vaccinators did very little work. On the 12th January, I attended a meeting of the leading men of Bareilly, which was presided over by Rai Bukhtawur Singh.

I inquired from the various Native gentlemen present whether they could suggest any remedy for the unsatisfactory state of vaccination in Bareilly, and in reply, was advised by the meeting to entertain as vaccinators two or more "Malis," the reason of the recommendation being that in Bareilly "Malis" are always called in to treat cases of small-pox.

I adopted this advice, and entertained two "Malis," but, hitherto, the reports I have received of the result of the experiment have not been satisfactory. I am now inclined to believe that the real cause of the non-success of vaccination in Bareilly was the excited state of the town, owing to disputes between the Hindoos and the Mahomedans.

Except in the city itself, the vaccination in the district of Bareilly was very good.

After inspecting vaccination in the zillahs of Bijnour, Moradabad, the Terai, and Bareilly, I marched to Allygurh, and went down by rail to Allahabad, in order to meet Dr. Richardson, who had taken charge of the Allahabad and Jhansie Circle about two months previously. I then returned by rail to Allygurh, and marched through Budaon, Shahjehanpore, and Pillibheet to Huldwanee, at the foot of the hills. The mode of testing the truthfulness of the returns of Rohilkhund vaccination was the same as that which I adopted when I was Superintendent of the Allahabad Circle. A letter was sent on ahead to the vaccinator, directing him to meet me on the boundary of the tehseel to which he was posted, and to bring with him his nominal rolls of all vaccinations performed by him since the commencement of the vaccine season.

These rolls are kept on separate sheets of paper, one sheet being devoted to each village, except in the case of large towns, where there is a separate sheet for each quarter or mohullah.

As soon as the vaccinator met me, I took from him the whole of his nominal rolls and compared them with the weekly and monthly abstracts which I had previously received from him by post. After having satisfied myself that the numbers given in the abstracts were the same as the numbers entered on the nominal rolls, I collected the latter into a heap, and drew at random two or more sheets, and informed the vacci-

nator, that he must show me all the children whose names were entered on the sheets which I had drawn.

This generally involved a ride of many miles from camp, but I made a point of seeing these particular children before inspecting any other vaccination.

On arriving at the village, I first inquired from the villagers whether the vaccinator had been there on the day he mentioned in his report. This is a matter of great importance, as a vaccinator might attempt to deceive his European Superintendent by showing him vaccinations done on a different day from that mentioned in the report. I then proceeded to inspect all the children whose names were entered on the nominal roll; and this is easily done, as the roll gives the name, age, and sex of each child, as well as the father's name and his caste.

Occasionally I was told that some of the children had either quitted the village or had gone away for the day to some neighbouring place, but in such cases I had little difficulty in satisfying myself whether the vaccinator's report was correct or otherwise. This was done by asking the people of the village to tell me the caste and age of the absent child, and their statements were compared with those given in the nominal roll, which had remained in my possession from the date of my arrival in the tehseel, so that the vaccinator could have had no opportunity of altering it to suit his purposes. After having inspected all the children whose names appeared on the rolls, I accompanied the vaccinator to any other villages which happened to be near, or to any villages in which small-pox had recently occurred.

10. The Agra and Meerut Circle is the largest in the North-Western Provinces, and has attached to it a hill district, consisting of the Native State of Tehree and of the British territory of Jounsar Bawur. In para. 2 of his report, the Superintendent, Dr. Pringle, mentions the superiority of the tubes filled in his own hill district as compared with those which he received from England: 80 per cent. of the former

were good, and only 50 per cent. of the latter. The difference can easily be understood, as, however good the lymph may be when it leaves England, a considerable percentage may be expected to be found bad after a long sea voyage, and more particularly after exposure to the heat of the plains of India, consequent on transmission by post from Bombay to the headquarters of the Superintendent and from there to the address of the vaccinator who is to use the tubes. Hill tubes, on the contrary, are kept in a cold climate until the time for using them arrives, and are then sent direct to the vaccinator.

In para. 9, Dr. Pringle states that in his return, vaccination of adults in jails, &c., has been entered under the column of "primary vaccination." In all the other circles these cases have been included under column 10, "revaccination."

In para. 11, the question of animal vaccination is discussed at great length, and I entirely agree with the opinions therein expressed. As far as I know, no good authority in England has ever approved of the introduction of the practice of animal vaccination. It has, however, been praised by some Continental authorities, and it has been found highly satisfactory in Bombay.

In his report for 1869-70, the Superintendent of the Central Circle, Bombay, Sub-Assistant Surgeon Anento Chandaroba, says:—

"The chief burden of our reports, year after year, was the "want of a sufficient quantity of good lymph.

"In animal vaccination, we have now provided to us the "means of producing a supply of lymph, the purest and most "effective, to an unlimited extent."

It appears to me that these paragraphs explain the reason why the practice of animal vaccination has met with exceptional favour in Bombay. In that presidency vaccination is carried on all the year round, and there are within its limits no lofty

mountains from which to draw fresh supplies of tubes and crusts. Under these circumstances, there must be a constant tendency to degeneration of lymph, however carefully it may be transmitted from arm to arm; so that I can easily understand that the introduction of animal vaccination has proved a boon to the city of Bombay. On the other hand, I can see no advantage to be derived from its introduction into the North-Western Provinces, where ample supplies of lymph can always be procured from the Himalaya mountains, and where there is during winter no tendency to degeneration of lymph, provided ordinary care is used in transmitting it from arm to arm. In para. 8 of his report Dr. Pringle mentions that the Tehree establishment has been diminished. I am glad to say this is no longer the case, as Dr. Pringle has informed me by a letter that the Rajah of Tehree has acceded to his wishes, and that the full establishment has again been entertained.

11. Dr. Milne, in his report on the Benares Circle, mentions the difficulties he has experienced with regard to the new forms of vaccine returns. The difficulties attending the preparation of these forms have been severely felt in all parts of the North-Western Provinces, but, as can be easily understood, these difficulties are greatest in Benares, where, in addition to the regular establishment, Dr. Milne has entertained a number of old inoculators, men who are generally quite uneducated and unable to read and write. In para. 8 of his report, Dr. Milne mentions the attempt he made in Benares to keep separate returns of operations for each police-station, instead of keeping, as formerly, one register for each tehseel.

This was also tried in Rohilkhund, and the Rohilkhund returns can be submitted to Government if required, but as the Superintendents of the Agra, Allahabad, and Benares Circles have sent in their returns for tehseels, and not for police-stations I have preferred to send in the Rohilkhund returns so as to correspond with those of the other circles. In

para. 13, Dr. Milne mentions the result of his experiments on animal vaccination. As it is difficult to judge accurately of such experiments, performed while marching daily, I propose, with Dr. Milne's assistance, to conduct a series of experiments on cows and buffaloes in Almorah this autumn. Hitherto I have not been able to try any experiments myself, as I was obliged to march rapidly during the whole of the last winter.

12. On the 14th November, 1870, Dr. Richardson took charge of the office of Superintendent of Vaccination, Allahabad and Jhansie Circle.

The chief peculiarity of this circle is, that within the last three years, and owing chiefly to the exertions of Dr. Stratton, Political Agent at Nowgong, no less than thirty-one local vaccinators have been entertained and paid for by the various Rajahs of Bundelkhund. It cannot of course be expected that the work of these local vaccinators should be equal to that of old and well-trained Government vaccinators, and it is probable that for some years to come the average number of persons vaccinated by each vaccinator, as well as the percentage of successful cases, will be lower in the Allahabad Circle, taken as a whole, than in any of the other circles. At all events, such has been the case this year.

In para. 10, Dr. Richardson mentions the great success that has attended arm-to-arm vaccination as compared with vaccination done from lymph carried on ivory points. The only argument in favour of the ivory-point system is that high-caste Natives sometimes object to have their children vaccinated with lymph taken in their presence from the arms of children belonging to any lower caste. This feeling will no doubt gradually disappear, but it is still felt in many parts of the North-Western Provinces, and in these places it will, I think, be wise to continue the occasional use of ivory points.

13. The Ajmere Circle is under the superintendence of Dr. Murray, Civil Surgeon of Ajmere, an officer who is also Superintendent-General of Vaccination and Dispensaries, Rajpootana. This district has lately been detached from the North-Western Provinces, but Dr. Murray's vaccination returns for Ajmere this year have been included in those of the North-Western Provinces, as, by Resolution No. 1995P., dated Fort William, 22nd November, 1870, Ajmere was only separated from the North-Western Provinces with effect from the 1st April, 1871.

14. The Superintendents of Circles in their reports make mention of the assistance they have received from various tehseeldars and Native gentlemen, and I have the honour to request that, as in former years, letters may be sent acknowledging their services. I have the honour to submit the following list:—

Agra Circle.

The Rajah of Tehree, Gurhwal.
Thakoor Koomar, Jugmundo Singh, of Budwas, in Etah.
The Tehseeldar of Kalsee, Jounsar Bawur.

Benares Circle.

Oudh Beharee Lall, Tehseeldar of Nuggra, Zillah Azimgurh.

Allahabad Circle.

Mudud Ally Khan Bahadoor, Tehseeldar of Maijah, in Allahabad.

Kyfayut Oollah Khan, Tehseeldar of Karrakat, in Jounpore.

Rohilkhund Circle.

Rai Bukhtawur Singh, Subordinate Judge, Bareilly.
Moulvie Khyrooddeen Ahmed, Deputy Collector, Bareilly.
Lalla Luchmi Narain, banker, Bareilly.
Wujeehoollah Khan, Mohulla Jullalnugger, Shahjehanpore.

Five of the Native Superintendents of Vaccination are also mentioned with high praise, and it would be a great favour if Government would acknowledge their services by a gratuity of one month's working pay, Rs. 20 to each man—in all Rs. 100.

This has been repeatedly done in other provinces, but no such gratuity has ever yet been given by the North-West Government.

I have the honour to recommend for a gratuity the following five Native Superintendents :—

Toolsee Ram,	Native Superintendent,	Dehra Doon.
Nubbi Bux,	ditto,	Cawnpore.
Rujubally,	ditto,	Humeerpore.
Ally Hussun,	ditto,	Jounpore.
Puddum Niddhie,	ditto,	Goruckpore.

15. In conclusion, I beg to thank Doctors Pringle, Richardson, Milne, and Murray, for their active efficiency during the past year, and have the honour to forward in original the reports they have sent of their respective circles. I regret the delay that has occurred in sending in this report, but the returns of the Ajmere Circle were only received yesterday, the 7th May, and some of the returns from Rohilkhund were only ready two days previously.

Abstract Return of Primary Vaccination in the North-Western Provinces for the years 1869-70 *and* 1870-71.

Native Superintendent.	Circle.	Season.	Vaccinators.				Total.	Successful.	Unsuccessful.	Unknown.	Total.	Average percentage.	Average number of primary vaccinations by each vaccinator.
			Paid by Government.	Municipal.	Local.	Native landlord.							
2	Kumaon, ...	1869-70, ...	10	...	3	...	13	21,334	1,066	852	23,252	95·24	1,788
		1870-71, ...	10	..	3	...	13	22,840	1,264	1,041	25,145	94·7	1,934
6	Rohilkhund, ...	1869-70, ...	30	10	1	...	41	67,290	7,835	3,811	78,936	89·57	1,925
		1870-71, ...	30	10	3	...	43	63,215	9,844	4,395	77,454	86·52	1,801
13	Agra and Meerut, ...	1869-70, ...	61	23	...	4	88	76,467	10,942	5,573	92,982	87·48	1,056
		1870-71, ...	61	25	...	3	89	72,239	8,947	6,650	87,836	88·9	986
9	Allahabad and Jhansie,...	1869-70, ...	55	5	...	17	77	37,298	17,223	6,981	61,502	68·41	798
		1870-71, ...	55	5	6	31	97	42,655	14,245	7,581	64,481	74·9	671
6	Benares, ...	1869-70, ...	28	4	1	1	34	28,745	3,876	1,532	34,153	89·03	1,004
		1870-71, ...	28	4	1	2	35	35,672	4,462	2,403	42,537	88·96	1,215
1	Ajmere, ...	1869-70, ...	4	3	...	...	7	6,164	1,688	680	8,532	78·5	1,218
		1870-71, ...	4	2	...	1	7	5,993	1,454	1,251	8,698	68·93	1,242
37	Grand Total, North-Western Provinces, ...	1869-70,...	188	45	5	22	260	237,298	42,630	19,429	299,357	84·77	1,151
		1870-71,...	188	46	13	37	284	242,614	40,216	23,321	306,151	85·7	1,077

BENARES CIRCLE.

[**No. II.**]—*Report by* R. M. MILNE, ESQ., M.B., *Offg. Supdt. of Vaccination, Benares Circle, No.* 104, *dated Mirzapore, 1st April*, 1871.

SIR,—I have the honour to submit for your information the results of the vaccine operations in the Benares Division for the season 1870-71.

2. My tour of inspection began this season at Bustee, early in November, and from that time up to date of report, I have, with one exception, examined the work of every vaccinator in the circle, and also the work done by the majority of the "Malis," who have been practising vaccination under my instruction.

3. Since last report, there has been no change in the establishment sanctioned by Government, and I regret to add that there has been no increase in the number of municipal vaccinators. During last season Benares supported two additional vaccinators; Chunar and Mirzapore one each. The Municipalities of Benares and Mirzapore have this year continued their assistance, but that of Chunar has ceased to do so, notwithstanding the hope expressed by Government that municipalities would increase their efforts to further the cause of vaccination. The reason given for the withdrawal is inability to support a vaccinator in addition to the dispensary and Native doctor, which are maintained without aid from Government. As a compromise, the Municipal Committee suggested that the Native doctor should be supplied with lymph and instruments for the purpose of carrying on vaccine operations. These were duly forwarded, but on the occasion of my visit to Chunar I was disappointed to find no result from this arrangement. To the Municipalities which had not formerly given assistance, namely, Ghazeepore, Goruckpore, and Azimgurh, I conveyed the wishes of Government, and invited their support regarding the extension of vaccination. The Municipality of Goruckpore at once responded to the appeal, and an extra vaccinator was then appointed to

the city. In answer to my petition to Azimgurh, the Magistrate replied that the arrangements for the formation of a municipal committee had not been completed, and that no funds were at the time available. The Ghazeepore Municipality also declined for the latter reason, namely, want of funds to support a vaccinator; but, at the instance of the Civil Surgeon, voted the sum of Rs. 5 *per mensem* to each of the two hospital apprentices, on the understanding that they would practise vaccination in the city, the Civil Surgeon at the same time promising to instruct them in the art, if supplied with lymph from the department. From this arrangement I hoped there might be some satisfactory return, but on my arrival in Ghazeepore I was disappointed to learn from the men themselves, that, with the exception of the few initiatory cases performed under the eye of my Native Superintendent, they had failed to do any work.

It gives me, however, pleasure to report that the liberality of the people of Suggree, in the Azimgurh District, continues to support an additional vaccinator for the outlying parts of the tehseel. I have also to mention that His Highness the Maharajah of Vizianagram, with his usual munificence, has this season added another vaccinator to the one he formerly entertained.

The vaccine establishment of this division now stands as follows:—

No. I.—*Establishment.*

Number.	Districts.	Tehseels.	Government vaccinators.	Municipal vaccinators.	Local vaccinators.	Vaccinators supported by Native gentlemen.	Native Superintendents.
1	Mirzapore, ...	3	3	1	...	...	1
2	Benares, ...	2	2	2	...	2	1
3	Ghazeepore, ...	6	6	...	...	...	1
4	Azimgurh, ...	6	6	...	1	...	1
5	Goruckpore, ...	6	6	1	...	...	1
6	Bustee, ...	5	5	...	...	...	1
	Total, ...	28	28	4	1	2	6

The staff of vaccinators at work during the season under report has thus been 35, showing an increase of one to the number of last year.

4. What I reported in reference to the activity of the lymph received from the depôt last year, applies also to the store obtained at the commencement of this season. The vesicle consequently proved good, and care having been always taken to remove the lymph at the proper time, it continued effective until the close of the season. The regular supply received from the Central Vaccine Institution, Edinburgh, has enabled me to replace the lymph in use, when I found such at all weak, and also to meet the requirements of the Civil Surgeons in the division. The reason of their demand for English lymph is the prejudice that exists in the minds of many European mothers against having their infants vaccinated from Native children.

It would not be inappropriate to mention here a case that came under my notice in the Azimgurh District, when small-pox was then prevalent. Two children on whom the vaccinator had operated showed perfect Jennerian vesicles, and at the same time an eruption of modified small-pox. I remarked that the villagers, instead of being alarmed at the appearance of this eruption, seemed rather satisfied, as it reminded them of the eruption that accompanies their favourite inoculation. I endeavoured to explain to them that the small-pox eruption was due to the poison of that disease having been imbibed previous to vaccination, and had no connection whatsoever with the operation on the arm. The vaccinator, thinking that the lymph from these cases would be more effectual than the ordinary virus, consulted me regarding the advisability of using it on others, but I told him that there would probably be no difference in the result. It is unusual to experiment from such cases, yet Mr. Simon, the Medical Officer of the Privy Council, has shown in his latest report that lymph taken from cases similar to those noted

above does not communicate anything but the ordinary cow-pox; and this he adduces as a proof that neither syphilis nor other constitutional disease can be transmitted with the lymph taken from a pure Jennerian vesicle.

5. There can be no doubt but that the aversion of the Hindoos to vaccination, and their prejudice against the removal of the lymph, are both slowly giving way. Year by year I hear less of the absurd superstitious notions that vaccination, under the pretence of being a preventive to small-pox, was a mysterious means employed by Government to violate the religious feelings of the people. It was not to be wondered at, then, that deaths caused by other diseases were naturally laid at the door of vaccination. In some few unfortunate villages where this delusion still exists the vaccinator has feared to risk showing his face again after the death of a vaccinated child from whatever cause. Happily, however, this state of ignorance cannot be lasting, since the beneficial effects apparent from vaccination must eventually bring the people from under it.

6. Following the plan I adopted last year for testing the accuracy of returns, namely, that of inspecting, not only the recent cases, but also those of an earlier date, and comparing these with the entry shown in the day-book, I found it necessary in three instances to remove the vaccinator for falsification of numbers. These three cases were too aggravated to be dealt with leniently. The first occurred at Nuggrah, in the Azimgurh District, and the culprit was one of the old inoculating "Malis" whom I had introduced into the department. The recent work he had ready for my inspection was creditable, and correctly entered in the books, but on my riding to a village some six miles off, where the entry was seven successful cases, I found it totally false. The man, it is true, had gone to the village about the time specified, but, failing to persuade the people to allow him to operate on their children, he, rather than show a blank day,

gave a false return. The second case which I detected, near Benares, was of a similar nature. The vaccinator had operated on several children in the village I picked out, but these were only about a third of the number recorded, and he could produce no village register of the cases entered in his day-book. The means by which I have been able to secure approximate accuracy of returns have been to hold each Native Superintendent personally responsible for the truth of all reports forwarded through him. This is less hard than it seems, as it lies quite in the power of the Native Superintendent to check the slightest attempt at falsification, demanding only a moderate amount of activity on his part to scrutinise the work of the five or six men under him. Considering this, it has been my habit to fine the Native Superintendent in whose district anything of the kind has occurred, but in one of the cases mentioned above I had to dismiss him as well as the vaccinator, as he had connived at the deceit, and otherwise been guilty of remissness of duty.

After the above was written, being in Benares for a few days, I thought I might as well examine the last work of the season, and see whether my men were to the very end equally prepared for inspection as when a visit from me was expected. The work of my oldest vaccinator, a man who has always given me much satisfaction, I found correct up to the latest entry, but I grieve to say that the manner in which the Native Superintendent and two of the vaccinators had been performing their work since my last inspection obliges me to dismiss them from the service and report them to Government. My suspicions were aroused when I saw in the day-book of one of the city vaccinators the name of a village, fourteen miles distant, where he had operated on three boys and three girls seven days previously. The Native Superintendent, Mahomed Bux, corroborated the correctness of this entry, but, to satisfy myself, I went out the following morning with the vaccinator to the village in question. My surprise may be judged when I found six boys of various ages waiting

my arrival, and all with fresh scratches of the needle on their arms. Before making any remark, I asked the youngest child when and by whom he had been vaccinated. He replied without hesitaton, "late last night," at the same time mentioning the vaccinator's name. Another and older child repeated this statement, until the vaccinator came up with the village register, when the cases entered corresponded with those before me, but not with the entry in the day-book. On inquiring into the matter, I discovered that the Native Superintendent was fully aware of the deceit practised, and that either he or the vaccinator himself had come out to this village during the previous night, and got up for my inspection these cases, to tally with the number recorded in the vaccinator's day-book. The other delinquent, a brother of the Native Superintendent, I found had lately made several false entries, and one in a village that did not exist. The verity of this man's book the Native Superintendent had also testified to. Having once before had occasion to warn this man on account of the false returns given by one of his vaccinators, I consider it my duty to report him as unfit to hold an appointment under Government.

7. The remarks I made in my last report regarding the elaborate forms now required from this department have been quite borne out by the experience of this year. In order to reach the capacity of the half-educated vaccinator, and wholly uneducated "Mali," with whom I have to deal in this district, I had printed in Nagree, in a form calculated to meet the requirements of Statement No. I. of the new vaccine returns, some five hundred copies each of "village registers," "day-books," and "monthly returns." Though these were simplified as much as possible, yet, to furnish all the information required by the Government of India, they contained even then no fewer than from twelve to twenty columns. At first the number of mistakes was overwhelming, and even now it is common to find a "Mali" making up his grand total of

cases by adding the totals of the "caste," "age," and "sex" columns all into one, thereby multiplying on paper the number actually vaccinated. From this it will, I think, be evident that the vaccinators and "Malis" have a larger share of office-work than is compatible with the satisfactory performance of their manual duties.

8. In accordance with the views of the Sanitary Commissioner with the Government of India, instructions were received just before the commencement of the vaccine season, to post the vaccinators to "mortuary registration circles," *i.e.*, to thannahs, instead of to tehseels as formerly. Now had Government at the same time sanction the appointment of a vaccinator to each such circle, there would have been no difficulty in carrying out the order, and undoubted good would have resulted from the increase to the establishment; but, with the present meagre staff, it has only served to cause confusion. The number of thannahs exceeds by many times the number of tehseels, so that the vaccinator of each tehseel, instead of the one record as before, was supposed to keep separate the returns for each mortuary registration circle. As far as my experience goes, the result of this has been to hamper and limit the vaccinator in his operations. For, during the month, he has either confined himself to one thannah, or, if embracing more, he has persisted in including all in one return. In the Punjab and Lower Bengal, where there is a travelling staff of vaccinators, the same difficulty is not experienced, as a separate vaccinator can be posted to each thannah; but here, unless an increase of men is granted, it will, I fear, be impossible to obtain a trustworthy return in the form required. Since there are said to be many objections to the police force in this country having the executive registration in their hands, Government might, in appointing a vaccinator to each thannah, include in his work the office of registrar—the man to send his mortuary returns to the Civil Surgeon as is done at present.

9. The following table is here introduced in order to compare the returns of this year with those of last :—

No. II.—*Annual Return, Season* 1870-71.

Circle.	Season.	Number of vaccinators.	Successful.	Unsuccessful and doubtful.	Unknown.	Total.	Percentage of success.	Average number of operations by each man per mensem.
Benares, ...	1869-70	34	28,745	3,870	1,532	34,153	89·03	200
	1870-71	35	36,488	4,731	2,453	43,672	88·52	249

This shows an increase of 7,743 successful cases, equivalent to a rise of 26 per cent. on the work of the preceding year. The percentage of success is this year 88·52, being a decrease of about a half per cent.; while the average number of operations by each man rises from 200 to 249 per mensem. With the exception of a few cases at Bilhabans in Azimgurh, and the same near Bustee, there has been no outbreak of small-pox to swell the returns.

10. On the recommendation of the Superintendent-General of Vaccination, Government last year sanctioned part of the money annually allotted for the instruction of hakeems being given towards the enlistment of inoculators into the Vaccine Department. At the commencement of the working season I was under the impression that the grant of Rs. 500 was to be devoted to this division, and accordingly set about making the necessary arrangements. The plan I adopted, and which I thought would secure the greatest return to the department, was as follows :—To appoint during the working season to each tehseel in my division an assistant or sub-vaccinator, such being a resident of the place, and, where possible, belonging to the inoculating, or "Mali," caste; this man to work separately from, but to send his returns through, the vaccinator, who would assist in their preparation: the Native Superintendent to inspect and report on the sub-vaccinator's work, and to be responsible for it as for that of the regular

vaccinator. Each sub-vaccinator to be allowed from the grant a subsistence allowance of Rs. 4 a month, and all vacancies occurring in the regular vaccine establishment to be filled up from the more efficient of the sub-vaccinators.

In October, with the assistance of my Native Superintendents and vaccinators I had made out a list of the "Malis" best qualified in each tehseel to become vaccinators. To each of these I issued a *purwanah* defining the nature of his appointment, and forwarded the necessary instruments. As soon as the vaccinator had established the vesicle, he gave what lymph he could spare to his "Mali" assistant, who immediately began work on his own account. From what I saw of these men's work during the first month, I was sanguine of being able to show a good return for the money entrusted to me. But on the 8th December I received a letter from the Superintendent-General to the effect that only Rs. 300 of the grant could be spared for the Benares Division. Disappointing as this was after the arrangements I had made, I had no alternative but to recall my instructions and limit my operations to the means at my disposal. The withdrawal of so many men had a very insalutary effect on those kept on, for many who had begun to work in good earnest were discouraged, believing their appointment insecure and their pay doubtful; while those who were dismissed naturally became opponents of the cause: If Government were pleased to grant next season the sum of Rs. 500 to this division, I feel assured that there would be a considerable increase in the returns, though perhaps not equal to what it would have been had this withdrawal not taken place.

11. There are many advantages that vaccinators taken from the inoculating caste have over others. Being as a rule residents of the tehseel to which they are appointed, and known to the people as inoculators, they consequently meet with much less opposition, and never require, as other vaccinators do, assistance from the tehseeldar or thannadars. In short, they

carry on their work without aid, either direct or indirect, if kept in the district in which they are known. But being men of no social status, and almost illiterate, they are quite unfitted for the posts of Native Superintendent or municipal vaccinator, and are thus debarred from the rewards of the department. In connection with their work, however, there is one drawback to "Mali" vaccinators, and that is, their dislike to vaccinate children of very low castes. This arises, not from any idea of their own superiority, but from the fact that they were prohibited by one of the old inoculation rules to operate on any children below a certain caste. Notwithstanding the assistance rendered by some civilians to gain over inoculators to vaccination, many of these men still continue to practise their art more or less secretly, though, perhaps, not to the same extent as formerly. Only four deaths arising directly from inoculation have been reported to me this season: two of these took place in Benares, and two near Dohree Ghat. There seems to be a growing impression, doubtless due to the vaccinators, that to practise inoculation is now criminal. This is proved by the petition lately presented to Government by Purtej Dass and others of Mouzah Bahoopore, in Ghazeepore, to be allowed to practise their old trade, from which they said they had been prohibited by the Magistrate. In accordance with the instructions of Government, I sent my Native Superintendent to try to induce these petitioners to adopt vaccination. He failed to make any impression on them, but I shall still do my utmost to bring what influence I can to bear, in order to prevail on them to change their practices. The case of these men is very different from that of the Tehseeldar of Syedpore, who, though aware of the discountenance of Government, had two children inoculated in his own house at the close of last vaccine season. Much credit is due to Mr. Oldham for entering into this case, and expressing so plainly his views, and the displeasure of Government, at such behaviour on the part of a Government official.

12. In order to train efficiently the local "Malis," it is necessary to have energetic Native Superintendents. Plains-men as a rule being more supine, I endeavoured to introduce for that purpose hill-men, who had been taught by Dr. Pearson. Unfortunately, however, the season at the end of the rains, when they have to join their appointments, is so very trying to the constitutions of men who have been all their lives in the hills, that I am doubtful whether I ought again to try the experiment. Two men out of the three sent died of fever within a week of their arrival.

13. Acting on the instructions conveyed in letter No. 4655 of the Junior Secretary to Government, North-Western Provinces, I wrote at once to Bombay, and, through the kindness of Mr. Anunta Chandroba, was favoured, on 4th January, with six tubes of the animal vaccine lymph in use there, which is the same as that procured by Dr. Blane from Mr. Warlomont. The day after its arrival, I vaccinated a heifer of about six months old with the supply. Up to the fifth day there was no symptom, either local or constitutional, of the system being influenced by the presence of the virus, and I began to regret having used all my stock on one animal. On the sixth day, however, a few vesicles began to form, and from these I took as much lymph as I could collect, and vaccinated another healthy calf. As early as the fourth day strong fever set in, and on the fifth day this calf was so ill that it had to be carried on a charpoy the greater part of the march. This fever was accompanied by a large crop of vesicles, but I did not think it advisable to operate on the human subject with lymph which had caused so much constitutional disturbance to a healthy heifer. Accordingly, with part of the lymph taken from this animal I vaccinated a third calf. This case running a more normal course I was enabled to vaccinate two children with the virus taken on the seventh day. On only one of these did a vesicle appear, and it was in no way remarkable for size or development, nor was it accompanied by any marked febrile symptom. With lymph I had taken from

the calf on the sixth day, I inoculated another heifer and a young buffalo. The former was successful, but the latter showed no result. I continued to experiment until the middle of February, when an unsuccessful case put a stop to my operations. From my experience I have not been able to detect any difference between the eruption produced on the animal from animal vaccine and that resulting from retro-vaccination; while the effect of the former on the human subject was less satisfactory than that caused by the usual humanized lymph. But in making such experiments I labour under great disadvantage, as, owing to my daily marching, it is impossible for me to watch to the end the individuals operated on, while I find I cannot sufficiently rely on the judgment of the vaccinator regarding the character of the eruption produced. Other difficulties with which I have to contend, owing to Hindoo prejudices, are the procuring of animals, and, when procured, obtaining the assistance necessary to perform the operation. This I have to do as best I can by having the animal held down, under a tree, instead of having him comfortably secured on the operating table used for the purpose by regular experimenters on animal vaccine. The method recommended for operating on animals is to make with the lancet a large number of punctures and incisions, and insert in each a little of the lymph. This plan is tedious and difficult of performance on an animal held down by hand. I have therefore found it more expedient to draw with considerable force a large, strong, four-pointed vaccine-needle along the shaven surface, on either side of the teats, a distance of three to four inches; and then, after inserting the lymph in these lines, to cross them at intervals with the same instrument, thus forming at each crossing sixteen points of intersection, equivalent to the same number of punctures with the lancet.

14. The chief, if not the only, reason why animal vaccine has become so deservedly popular in Bombay is on account of the deficiency of a good supply of lymph in that presidency,

for, as they say, that was "the burden of their annual reports." Having no such range of hills, they cannot, as we do, replenish the stock from operations carried on there during the hot months. There being no such urgent reason here for change, or even increase of the present supply, I think any attempt to introduce animal vaccination into this division, considering the the prejudices of the Hindoos, would soon prove detrimental to the progress of vaccination.

Apart from this, the supposed advantages derived from animal vaccination are now believed to be very doubtful. After a very fair trial, the leading authorities at Home have decidedly expressed their opinion against its introduction. Consequent on a special report on the subject presented last year by Doctor Ballard, the English Government deputed Doctor Seaton, the author of the "Handbook of Vaccination," to visit the Continent, and report on the results of animal vaccination as seen there. He has embodied his observations in a most valuable and comprehensive report, which will be read with advantage by all who take any interest in the subject of vaccination. The conclusions he arrives at are thus shortly summarized by Mr. Simon:—"Facts stated in Dr. "Seaton's report show most clearly that the system [of ani- "mal vaccination] as at present understood has certain great "disadvantages; and these, in my opinion, are of such a kind "as at present entirely to forbid an adoption of the system "in place of our own, unless on independent grounds our "own already deserved to be condemned. The disadvantages "at present imputable to animal vaccination are its various "peculiar liabilities to failure: first, that apparently even "able and painstaking operators may find it impossible to "transmit successive vaccination from calf to calf without "very frequent recurrence of failures and interruptions; "secondly, that the transference of infection from the calf to "the human subject, even under the most favourable circum- "stances (*i.e.*, by experienced operators and with lancet direct "from calf to arm), has in it such risks of failure, that, for

"instance, at Rotterdam, the proportion of unsuccess was "nearly twenty times as great as in the ordinary arm-to-arm "vaccinations; and thirdly, that the calf-lymph as compared "with ordinary lymph is peculiarly apt to spoil with keep- "ing, and in the form of tube-preserved lymph can so little "be relied on, that the Rotterdam establishment in distribu- "ting supplies of lymph now uses only lymph from the human "subject. Evidently, then, in the present state of knowledge, "a system of animal vaccination would have in it an extreme "uncertainty of operation; and this uncertainty would, for "obvious reasons, be so conclusive against our preferring the "system on its own merits for purposes of public vaccination, "that practically we have only to consider whether our own "system has demerits entitling it to any considerable mistrust. "To the question whether any such mistrust ought to be en- "tertained, I have already in part given a satisfactory answer "in reporting the undiminished efficiency of the lymph sup- "plied by our national vaccine establishment."

15. It is now my pleasing duty to acknowledge the assistance rendered to the cause of vaccination by the Tehseeldar of Nuggrah, and also the exertions of Puddum Niddhie, my Native Superintendent for Goruckpore, towards the enlistment of local inoculators into the department.

ALLAHABAD AND JHANSIE CIRCLE.

[No. III.]—*Report by* J. RICHARDSON, ESQ., M.B., *Supdt. of Vaccination, Allahabad and Jhansie Circle, No.* 40, *dated Camp, Cawnpore,* 1*st April,* 1871.

I HAVE the honour to submit the following report of vaccination in the Allahabad and Jhansie Divisions of the North-Western Provinces for the year 1870-71.

2. I received charge of the office of Superintendent from my predecessor on the 14th November last, and shortly after the commencement of the working season in the plains.

3. I have been able to inspect the work of all the vaccinators in the four districts of Jhansie, Lullutpore, Jaloun, and

Allahabad. I also examined the work of the majority of those employed in the districts of Cawnpore, Humeerpore, Banda, and Futtehpore. Of the Jounpore District I have seen only one vaccinator, and the work done by him. Of the Bundelkhund States I have examined the work of the vaccinators employed in Dutteah, Leekumgurh, and Sumpter.

4. Except in these Native States, the vaccine establishment has remained of the same strength as last season. The subjoined table will show the number and distribution of the vaccinators and Native Superintendents:—

District or State.	Number of tehseels.	Number of Government vaccinators.	Number of municipal vaccinators.	Number of local vaccinators.	Number of vaccinators paid by Native States.	Number of Native Superintendents.
Jounpore, ...	5	5	1	...	...	1
Allahabad, ...	9	9	2	...	...	1
Futtehpore, ...	6	6	...	...	...	1
Cawnpore, ...	9	9	1	...	...	1
Banda, ...	8	8	1	...	...	1
Humeerpore, ...	6	6	...	6	...	1
Jaloun, ...	5	5	...	...	...	1
Jhansie, ...	4	5	...	...	...	1
Lullutpore, ...	2	2	...	...	...	1
Nowgong, ...	...	...	...	...	1	Under Native Superintendent of Humeerpore.
Orcha, ...	...	...	...	...	3	
Dutteah, ...	...	...	...	...	3	
Sumpter, ...	...	...	...	...	3	
Oomrao, ...	...	...	...	...	1	
Kadoura, ...	...	...	...	...	2	
Punnah, ...	...	...	...	...	3	
Churkheree, ...	...	...	...	...	4	
Chaturpore, ...	...	...	...	...	2	
Beyawur, ...	...	...	...	...	1	
Lareela, ...	...	...	...	...	1	
Kothi Darounda,	...	...	...	...	1	
Alipore, ...	...	...	...	...	1	
Garowli and Logassee,	...	...	...	...	1	
Jugnee, ...	...	...	...	...	1	
Pauldio, ...	...	...	...	...	1	
Gourihaur, ...	...	...	...	...	1	
Toree Futtehpore,	...	...	...	...	1	
Total, ...	54	55	5	6	31	

5. No fewer than twenty additional vaccinators have been appointed during the year in the Native States of Bundelkhund. Some of these were, however, appointed so late in the season that they have been unable to do much, and the majority are necessarily very inexperienced. This will account for the small amount of work done in proportion to the number of vaccinators.

6. Until now, the Native Superintendent of the Humeerpore District has been in charge of the vaccinators in the Native States as well. He is a most energetic man; but it is obviously impossible for one man efficiently to supervise the work of forty-three vaccinators scattered over a wide extent of extremely difficult country.

7. During the working season, several changes have been made in the Government vaccine establishment. One Native Superintendent has been dismissed for gross and continued neglect of duty which went far to bring vaccination in the most populous and important district under my charge to a standstill. Three vaccinators were dismissed for falsifying their returns, three for absenting themselves from their districts and duties without leave, and one for laziness and insolence to his Native Superintendent.

8. The total number vaccinated during the past year was 64,481; last season the number was 61,502: this shows an increase of only 2,979. But the number successfully vaccinated this season exceeds last year's number by 5,357, or more than 14 per cent. This in estimating comparative success is the only important point. The percentage of successful cases has also risen from 68·4 last year to 74·9 during the present.

9. This last favourable result is chiefly due to the success which followed the effort to introduce vaccination from arm to arm, to the supersession of vaccination by means of dried

lymph on ivory points and lymph preserved in glass tubes. The latter mode was all but universal in the two divisions under my charge, and to this no doubt is owing the low ratio of successful cases as compared with other circles.

10. Although I know that arm-to-arm vaccination was the rule in the Benares Division, my Native Superintendents and vaccinators assured me that this could not be adopted in my own circle, owing to the caste prejudices of the people. Such statements led me to be extremely cautious in attempting its introduction. I began by vaccinating three children in a village in the Lullutpore District. I left the vaccinator to continue the work after me. The people made no objection either to myself or the vaccinator. Subsequently, whenever lymph was obtainable, I continued to vaccinate from arm to arm, and during the whole of my tour I have never heard any objection urged. Of course I did not select a sweeper's child to supply lymph for the child of a Thakoor, but I have vaccinated the children of the latter from those of Sonars, Kahars, and even Koris, without a remark on the subject of caste being made.

11. It will serve to illustrate the superiority of arm-to-arm vaccination when I state that of 2,952 vaccinated in this way in the Cawnpore District only 179 were unsuccessful. The result was unknown in 182 cases. This gives the ratio per cent. of successful cases to be 93·6. The ratio for the Allahabad and Jhansie Divisions was only 68·4 during last season, and this year only 74·9.

12. It was only set afoot in the Cawnpore District about the middle of January, and yet before the end of March 2,952 children had been vaccinated from arm to arm. In other districts it did not make such progress. This I attribute more to the ignorance of the vaccinators as to its advantages, and the mode in which the operation ought to be done, than to any objection on the part of the people.

13. It is not so much the saving in labour which it effects, in preventing the necessity for repeating the operation again and again, which recommends arm-to-arm vaccination. Another great advantage is the diminution of the number of those cases in which, the operation having been unsuccessfully performed, the subject of it cannot again be found by the vaccinator, or, if found, cannot be induced to have it repeated. The operation having once been performed, the parents of a child assume that it has been vaccinated, no matter whether the vesicle follows or not. If it has proved unsuccessful, not improbably next epidemic the child is seized with small-pox and dies. This is immediately noised about as a proof that vaccination, if not harmful, is at least useless. I have met with several such cases, and the harm they do amongst an ignorant people is great. Arm-to-arm vaccination, if it would not entirely prevent the occurrence of such instances, would greatly reduce their number.

14. Except in the Allahabad District, nothing like systematic or deliberate falsification of returns has been observed.

15. Taking them in the order in which they were visited by me, a few brief remarks may be made regarding each district.

16. Progress in the Jhansie District has not been satisfactory. The number vaccinated has fallen from 2,578 to 2,481. The Native Superintendent is ill-suited for his post, and will have to be removed. He is of low caste, and deficient in manners and energy. The vaccinator employed in the Ganotta Tehseel was caught falsifying his returns, and dismissed. In Mhowraneepore I found the people so opposed to vaccination that a commencement could not be made until the Assistant Commissioner, Mr. Sturt, came to my aid. His influence with the people is very great, and to him is entirely due the credit of having placed vaccination on a firm footing in this sub-division.

17. Like the Jhansie District, that of Lullutpore is unfortunate in its Native Superintendent. He is old and lazy: his removal will be necessary before much progress can be expected. The numbers vaccinated last season were 1,592; this year they are only 1,369. Had it not been for the practical aid given the vaccinators by Colonel Davidson, I fear vaccination would have proved a greater failure.

18. In the Jaloun District, the vaccine staff were left almost entirely to their own resources. Little assistance, so far as I am aware, was received from the authorities. The Native Superintendent and vaccinators are energetic men, but the people are very hostile to vaccination. This is more particularly the case in the remote tehseels of Koonch and Madhogurh. Towards Calpee, where intercourse with the Cawnpore District is frequent, greater success has been attained. I spent a considerable time in this district endeavouring to clear the way for the vaccinators, and vaccinated upwards of 60 children, belonging chiefly to the better classes. The number vaccinated rose from 701 last year to 1,672 this year.

19. As in former years, vaccination has been attended with greater success in the Cawnpore than in any other district of this division except perhaps Humeerpore. The people appear really to appreciate its benefits, and applications to the Native Superintendent for the services of a vaccinator have been numerous. The district-authorities during their visits to the villages make it a point to test extensively the accuracy of the vaccinators' returns. The advantage arising to vaccination from the recognition thus given to it by those to whom the people are accustomed to look up, cannot be over-estimated. The Native Superintendent, Nubbee Bux, is, without any exception, the best of all my subordinates. The total number vaccinated fell from 14,432 last year to 14,162 this year; but the number successfully vaccinated rose from 9,357 last year to 10,292 this year. As already explained, this satisfactory result is due to the success which attended

the introduction of arm-to-arm vaccination in the Cawnpore District.

20. In Humeerpore vaccination continues to progress favourably. The Native Superintendent is very industrious; but as vaccination extends throughout the States of Bundelkhund he will be unable to do full justice both to these and his own district. It would be well if a separate Superintendent were appointed to each. The numbers vaccinated have increased from 9,181 last year to 11,504 this year.

21. Banda, although a neighbouring district to the above, offers a striking contrast in so far as vaccination is concerned. The Native Superintendent is energetic and is well supported by his subordinates, but success does not result. The people, more especially in the eastern end of the district, are very hostile to vaccination, and not unfrequently threaten the vaccinators with personal violence. I have myself met with insolence from the inhabitants of a village, that of Bhowree, near Kirwee. The numbers vaccinated this year were 4,577, and last year 4,617, showing a slight decrease.

22. Vaccination in Futtehpore is fortunate in having a good Native Superintendent, and in having the hearty and practical aid of the district authorities. The number of vaccinations has increased from 4,001 last season to 5,993 this.

23. I have already casually referred to the Allahabad District. Had it not been for the failure of vaccination here, I would have been able to show greatly more favourable returns for the year 1870-71. The Native Superintendent bore a high character for energy and ability in former years, and I was unwilling to attribute the decline of vaccination in Allahabad to any shortcomings on his part until I had made a thorough personal investigation into the way in which he had been conducting his duties. I visited every vaccinator in his district, and minutely examined the work and registers of each. It was soon apparent that some of the registers were false, and that the Native Superintendent,

if he did not actually connive at this, at least took no trouble to detect and bring to notice the offenders. It was also proved that his own weekly account of his work was false, and that he had spent the greater part of the season in the town of Allahabad, when he ought to have been visiting the district vaccinators. Some of the latter he had not visited once. As a consequence, they did little or no work, and some made up for this by drawing up imaginary lists of children vaccinated by them. On the conclusion of my inquiry, I obtained the dismissal of the Native Superintendent and of the vaccinators of Barah and Soraon, both of whom had falsified their returns. In one tehseel of this district only did I find the work good: in the tehseel of Mega. This was owing to the interest taken in vaccination by the Tehseeldar, Mir Muddud Ali, who has on former occasions received the thanks of Government on this account. The numbers successfully vaccinated in Allahabad this season were 4,797: last year they were 10,579. This will show the mischief which may be caused by the misconduct of one man. Another Native Superintendent of much experience and promise has been appointed, and I feel sure that next season Allahabad will regain its lost position.

24. I saw little of the state of vaccination in Jounpore, but what I did see was satisfactory. The Native Superintendent is a man of experience and energy, and is much assisted by the district officials. As in previous years, the Tehseeldar of Karakul has given every assistance to the vaccinator employed in his tehseel. Jounpore is the only district under my charge in which inoculation prevails. I visited a village in which the chief zemindar and several others had refused to have their children vaccinated, but had them subsequently inoculated. So far as I could learn, no harm resulted to the children, nor had small-pox ensued. In this district there has been a slight falling-off. This year the numbers vaccinated were 3,938, and last year 4,450.

25. The municipal vaccinators, excepting those of Allahabad, have worked well. The numbers have fallen from 5,590 last season to 2,956 this; a result chiefly due to the unfortunate state of matters in Allahabad. In this city the numbers fell from 2,819 last year to 779 this year.

26. Throughout the Native States of Bundelkhund, vaccination is making decided progress. I was able to examine the work of five of the vaccinators employed in Dutteah, Teekumgurh, and Sumpter. In the first and last of these States, it struck me the authorities gave the vaccinators but very half-hearted aid. In Teekumgurh the case was different: there, the Rajah evidently understands the benefits likely to result to his people from the introduction amongst them of vaccination, and gives it his hearty support.

27. In certain districts somewhat unnecessary care, as it appears to me, is taken to assure the people that vaccination is entirely voluntary. In so far as nothing like compulsion is intended, no doubt it is voluntary; but from what I have seen, the people are already sufficiently aware of the fact, and repeated assurances on this point, besides being unnecessary, tend greatly to render the people averse to its acceptance, and even insolent to the vaccinators. To the solicitations of the latter they reply that the Magistrate has told them they may accept or decline vaccination just as they like, and that it is not their wish to have their children vaccinated. Were vaccination voluntary in the sense that, being simply placed within their reach, the people were left entirely to themselves to accept or to reject it, the thousands now being vaccinated would speedily sink to hundreds or even to tens. It is only by bringing it to their doors, and using every legitimate means to induce them to avail themselves of its benefits, that any progress can be made. When the influence of the district authorities is brought to bear in the same direction the efforts of the vaccinators are greatly aided; in fact, to such an extent is this the case, that I attribute the difference in

which vaccination has made way in neighbouring districts as much to the degree in which the authorities have interested themselves in its promotion as to any difference in the caste or other prejudices of the people, or to greater or less industry and skill on the part of the vaccine establishment.

28. The very small extent to which the bulk of the population of the two divisions under my charge has yet been reached by vaccination, will appear from the following calculations. The population being 6,524,763, and taking one-thirtieth of this as the number of children born annually, to thoroughly protect these there ought to have been 217,492 successful vaccinations. But, deducting those vaccinated in the Bundelkhund States, there remain only 35,245 such cases, and, even supposing all of these to be under one year of age, this would protect less than one child out of every six. Making similar calculations for each of the nine districts included in the Allahabad and Jhansie Divisions, the result, leaving out fractions, would stand nearly thus:—

In Humeerpore,	...	1	child in	2	has been protected.
Cawnpore,	...	1	„	3	„ „
Futtehpore,	...	1	„	6	„ „
Lullutpore,	...	1	„	9	„ „
Banda,	...	1	„	9	„ „
Allahabad,	...	1	„	9	„ „
Jounpore,	...	1	„	10	„ „
Jhansie,	...	1	„	10	„ „
Jaloun,	...	1	„	16	„ „

The above will help to show how much yet remains to be done to thoroughly protect the infant population of these divisions from small-pox by means of vaccination.

29. Of small-pox, up to the end of March I have seen nothing, although I heard of some cases having occurred amongst the camp-followers of the Royal Artillery at Allahabad, and also of its prevalence to a considerable extent in

the town of Cawnpore. Into the truth of the latter report I had an opportunity of making personal inquiry. From the statement of the Native Superintendent of Vaccination, it appears the Bazaar Sergeant brought to the notice of the Cantonment Magistrate the prevalence of the disease. Inquiry was made, and the report seemed to be confirmed. The Native Superintendent himself agreed that a mild kind of what he and others called small-pox had broken out, and confessed that the vaccinated appeared to fare alike with the unvaccinated. I asked him to show me some of the most severe and best-marked cases. The first he showed me was a distinct and very serious case of measles. Under treatment, the subject of it, a little girl, ultimately recovered. The rest of the cases shown me were, also, in reality only cases of measles. One child, also, a little girl, I know to have died of the disease, and I heard of several other deaths from the same cause. Yet all of these cases were considered, and I believe reported by the police, to be cases of small-pox. As such they will no doubt find their way into the returns of the Sanitary Commissioner. It can hardly be expected under these circumstances that any correct conclusion can be arrived at as to the extent to which the mortality from small-pox is affected by vaccination, whilst those entrusted with the collection of mortuary statistics, and even vaccinators, fail to distinguish between measles and small-pox.

30. Even were it possible to show by accurate statistics, as contemplated in the Report of the Sanitary Commissioner with the Government of India, para. 327, the effect of vaccination in influencing the prevalence of small-pox, I do not think the people would be convinced by such facts. If conviction is not brought home to them by the living proofs of the protection afforded by vaccination in the case of their own and their neighbours' families, it is hardly probable that large statistical truths, which from their ignorance they can little appreciate, will have much influence.

31. Meantime we must patiently persevere, in the hope that truth will ultimately prevail. It is no doubt satisfactory to be able to indicate progress by large and increasing returns of numbers vaccinated; but I believe with others, that a more important object to keep in view is the improvement of the quality of the work done, and the careful avoidance of mistakes. One such mistake whilst the people are still prejudiced and suspicious would cause more mischief than hundreds of successful cases could repair.

32. During my tour I saw only one instance of serious ill effect following vaccination. In the town of Kurrah, in the Allahabad District, the child of a respectable Mussulman, a Cazee, had been vaccinated some time previous to my visit. Violent inflammation of the upper arm had ensued, and sloughing had followed. At the time of my visit a large, circular, healthy sore remained, and was evidently quickly healing up. Two other children of the same family had been successfully vaccinated at the same time with lymph from the same source. In both cases the vesicle had run its normal course without anything unusual. The father, a very intelligent man, made little of the accident; but several others were loud in their condemnation of vaccination, and in my wanderings through the town I was several times asked about the Cazee's child.

33. I received Rs. 100 on account of the instruction and payment of hakeems. As I made the performance of actual work, and the submission of a list of those vaccinated, the claim upon me for payment, I have still the money in my possession.

34. During the working season, two large supplies of lymph were obtained from England at a cost of £13-8-0. This sum I paid from my contingent fund. I cannot say that I found this lymph superior to that obtained from the hills, either as regards its activity or the quality of the resulting vesicles. At first, I thought there might be some defect in my mode of performing the operation to account for my repeated

failures. Of twelve children vaccinated by myself on two different days only five *took*. On the latter of the two days I got an experienced vaccinator to operate on other twelve. His success was even less: only three of his cases were successful. This was in the month of December. With the lymph from the hills other vaccinators succeeded better, and I saw several typical vesicles follow its use. Towards the end of the month I received a supply of fresh crusts from the hills. In every instance in which these were used excellent vesicles followed.

35. In conclusion, I must not forget to mention the valuable assistance I received from my writer, Mir Ahmed Ali, when I first assumed charge of my appointment and was new to the work.

AGRA AND MEERUT CIRCLE.

[No. IV.]—*Annual Report by* R. PRINGLE, ESQ., M.D., *Superintendent of Vaccine, Agra and Meerut Circle, dated Camp, Dehra Doon, 5th April,* 1871.

THE establishment of the Agra and Meerut Divisions during the season 1870-71 was as per margin, being the same as that for the previous year.

Establishment.
1 Superintendent.
12 Native Superintendents.
61 Vaccinators.
1 Writer.
2 Chuprassees.

2. This, as usual, was commenced in May, under my own superintendence, with vaccine lymph received from the National Vaccine Institution, London. The supply received amounted to 100 tubes, of which 50 per cent. contained vaccine lymph in a fit state for operating with, and proved eminently successful; 30 per cent. were unfit, from impurities, &c.; and in the remaining 20 per cent. the lymph had completely dried up. The operations with this vaccine lymph in the hands of our Native Superintendent, and an average of two vaccinators,

The collection of vaccine lymph under the snowy range for the plains operations of the season under report.

resulted in 1,066 tubes and 586 crusts—a supply more than sufficient for the wants of my 89 vaccinators, and for all demands made on my office for vaccine lymph. Of the former, 80 per cent. were good, and nearly all the latter were, judging from external appearances, all that was necessary for a good vaccine crust; but the unavoidable age of some, and the exposure to high temperature of others (probably in transit), made an unusually large number of them inert; and when the temperature at which a vaccine crust is rendered inactive is taken into consideration, their inefficiency from the latter cause in the first week in November was not to be wondered at. The quality of this lymph, however, particularly that in tubes, has been good, and none of the officers whom I have supplied with it have reported their failure in establishing a good vesicle from the first supply sent. This I think may be considered a good test of its quality in other hands than those of my own establishment.

The establishment of the vaccine vesicle in the plains in November, 1870.

3. During the month of November, 1870, the heat for the first five days was unusually great, and the lymph employed during this time was therefore in a great majority of cases unsuccessful. On the 7th, however, the weather became cooler, and the operations more successful. Under these circumstances the vesicle could not be said to have been fairly established till the 15th November, and lymph available for any considerable number of operations till the 20th.

Closing of the vaccine season.

4. As usual, orders were sent to close work for this season on the 15th March, but the sudden rise in the temperature at the end of the first week in March virtually put a stop to vaccination by the 10th, and some cases which I inspected on the 13th, though in young children who are generally kept in the house, and on whom the operation was lightly performed, were clearly injuriously affected by the heat.

Actual period over which this season's operations extend.

5. From the circumstances alluded to in the preceding paras., the vaccinating season in 1870-71 cannot be calculated on five months, as a reference to Statement No. II.* will show. By this return, the operations for what is entered as the whole of November were 9,159, while that for what really was half of March was 11,666. Vaccination cannot be said to have fairly commenced till the vaccinator has a sufficient number of cases to admit of fresh lymph being available daily for at the very least ten cases, and as a rule, this was generally hardly possible much before the 20th of November. The season, therefore, to be taken into consideration when calculating the monthly number of each vaccinator, should be even less than four months at the most, and certainly not five, as is directed to be employed in this report.

Tour of the Superintendent.

6. Acting up to the remarks I made in my annual report of last season under this head, *viz.*, that it was better to inspect one division thoroughly each alternate year than to march hurriedly through two, inspecting only the work on the line of march, I have this year inspected the Agra Division with the same care which I devoted to that of Meerut in the previous season, with the addition of inspecting any work in the Meerut Division which lay on my line of march to Agra. I have thus seen and become personally acquainted with every Native Superintendent and more than two-thirds of the vaccinators in my divisions during the past season. My camp left Dehra on the 31st October, 1870 (as soon as possible after the despatch of the hill lymph to the various headquarters of the Native Superintendents for distribution among their vaccinators), and returned to Dehra on the 1st April, 1871. As was to be expected, much has been seen and heard during the above extended tour which appears to me worthy of record, and to which I shall allude in detail either in separate paras. or under the head of general remarks.

* Not printed.

Annual returns.

7. The returns this season have been drawn up according to those last furnished from the office of the Sanitary Commissioner with the Government of India, and though they have required greatly increased clerical work in their compilation, yet Statement No. I.* is so full, and the means of comparison so ready at hand, that the labour spent on it is more than compensated for in the perspicuity with which the results are recorded, since, with the exception of the twelve vaccinators noticed in the margin, whose operations are taken on an average, the work of the remaining 77 vaccinators for the season is most clearly shown. As I have in para. No. 10 discussed the subject of the numbers of the operations performed by each vaccinator, I will not enter into it here.

	No. of Vaccinators.
Tehree, ...	3
Meerut Municipality, ...	2
Allygurh ditto, ...	2
Hattrass ditto, ...	2
Agra ditto, ...	3
	12

With reference to the decrease in the total of operations performed during the past season, I am afraid an indulgence, which I felt it to be my duty to grant (as no ordinary holidays are allowed during the vaccine season), after obtaining the consent of the Officiating Superintendent-General of Vaccine, North-Western Provinces, *viz.*, of making Sunday a day of rest in this department, as it is in every other Government one, has had not a little to do with it. For instance, 986 is the average number for each vaccinator during the season, which, according to my calculation of four months, say of 30 days each, and deducting 16 Sundays, leaves 104 operating days, during which 986 operations were on an average performed by each vaccinator, or upwards of nine on each working day; if, therefore, these 16 Sundays had not been exempted, there would have been 12,816 extra operations, or upwards of 7,000 in excess of the previous season. It is worthy of note, however, that the number of the cases per diem fixed as the maximum of good work, and alluded to in para. No. 10, has, during the past season,

* Not printed.

been nearly reached on an average by all the vaccinators. I am not aware if in the other vaccine circles of the North-Western Provinces vaccination is carried on on Sundays, but when I state that not a single holiday of the numerous ones occurring between the 1st November and the 31st March is allowed in my divisions, I think it will be granted that the vaccinators and Native Superintendents absolutely require some rest in five months. Sickness, and, perhaps, the risk of insult during the excesses of the two days in the Holee festival, are the only excuses accepted for a week-day being blank in a vaccinator's or Native Superintendent's diary. There is also another cause for the decrease under notice, and which is well shown in Statement No. I., being due to the promotion to Native Superintendent of a good vaccinator, and his place being filled by a stranger to the district, and an inferior operator. The case I allude to is under the heading of Kerowlee, in the Agra District. The vaccinator who worked there in November and December performed 590 operations in these two months, while the man who succeeded him on his promotion to Native Superintendent, in the remaining three months performed only 424 operations, when vaccine lymph should have been in abundance, and the result has been a loss of upwards of 600 operations in the season when compared with the last. Other similar instances could be adduced of this apparent injury to the department by the promotion of a good vaccinator to a Native Superintendent, though, perhaps, not exhibiting such a total loss in result; yet, not to reward a deserving vaccinator because it might affect the numerical returns, independent of being a grave injustice to the vaccinator himself, would remove all stimulus to good work, and would end in making each vaccinator do only enough work to retain his post, and nothing more. The rate of success is nearly 1½ per cent. higher than last season, and has now in my opinion almost reached its limit, unless steps are taken to convert the *oomedwars*, or applicants for the post of vaccinator, into a recognized grade

of the department. In the Vaccine Department of the North-Western Provinces the primary vaccine instructions are very defective. An *oomedwar* may be described as an applicant for a post who lives on hope instead of pay, for a longer or shorter period depending greatly on his private means, or the salaries of his relations in the department; and more than once have I seen most promising men obliged to go home for some money to carry on a little longer, and when the nomination came, the answer not unfrequently sent was the *oomedwar* had returned to his home. To remedy this state of things, the only method I can think of is to form a grade of supernumerary vaccinators, as is recommended in Bombay, but this would involve an increase to the vaccine grant which under the present financial difficulties of the country seems impossible; and it is unnecessary, therefore, to discuss the subject more in detail, or to propound a scheme by which a trained staff of vaccinators might be ready to fill up vacancies. The only other subject in Statement No. I. which calls for any special remark is the fact of the number of operations performed by each vaccinator varying as much as they do; but having devoted a para. to this important subject, I need not enter into it here.

8. The number of the municipal vaccinators during the past season has been as per margin, showing a decrease of one in the Tehree territory as compared with last year, to which I will allude hereafter, and the continuance of the two semi-attached vaccinators at Meerut, *i.e.*, two selected men taken from the *oomedwar* list of this establishment, and employed only during

Municipal Vaccination.

Municipalities.

	No.		No.
Agra,	3	Furruckabad,	1
Allygurh,	2	Julleysur,	1
Hattrass,	2	Etawah,	1
Atrowlee,	1	Kasgunj,	1
Hurdoegunj,	1	Boolundshuhur,	1
Secundra Rao,	1	Anoopshuhur,	1
Muttra,	1	Khoorjah,	1
Bindrabun,	1		26
Kosee,	1		
Mynpoory,	1	Meerut extra,	2
Saharunpore,	1		28
Moozuffernuggur,	1		
Tehree,	3		

the vaccinating season by the Municipality. Their work has been incorporated with the others, as it has been under the superintendence of the Native Superintendent of the district. Agreeably to the orders of the Government, all the municipal vaccinators were, at the close of last season's work, placed under the orders of the Magistrate of the district, or the several municipalities, who in turn transferred them to the Civil Surgeons. With the exception of one district in which there are seven of the municipal vaccinators, all the others worked as compounders at the dispensaries in their various municipalities; thus one object of the Government in their late order has, as far as possible, been carried out, and these vaccinators have had an opportunity of seeing and becoming acquainted with the class of people who apply at the dispensaries for medical assistance. In the instance of the exception above alluded to, the reverse of this has been the case; and as a rule every municipal vaccinator has been sent to a different dispensary from that located in the municipality to which he belonged. The result of this, and the withdrawal of the privilege of residing at their homes on reduced pay during the non-vaccinating season, has led to these appointments being viewed as a punishment, and thus the only promotion in my gift to a deserving vaccinator, with the exception of that to the post of a Native Superintendent, has been removed, and some of the best vaccinators who have been promoted to a municipality for good work are now petitioning to be reduced to the establishment, or threatening to resign. During the past season, I have as far as possible appointed compounders who have learnt vaccination to these posts, and invited this class of applicants to qualify themselves for the municipal vaccinators; but the numbers as yet have been very limited. I regret to have to report that, during the season under notice, considerable difficulty has been experienced in regularly disbursing the pay of some of these municipal vaccinators; and when it is taken into consideration that the credit of these men in the villages

rests in a great measure on the regularity with which they receive their pay (they for the most part being total strangers), their efficiency as vaccinators is not likely to be promoted, and the temptation to practise extortion for self-support is immensely increased. In the instance of one municipality, their vaccinator's pay has not been remitted to this office since the 1st November, 1870, the date to which the last vaccination grant extended; and when I wrote to the President informing him of this, his reply was that nothing could be disbursed till the budget was passed in April, 1871. In replying I remarked that a large municipality like that of which he was the president had surely larger funds to draw upon than an office like mine, and requesting a remittance; his answer was that it could not be granted. Had an intimation to this effect been sent to me when I wrote asking the municipality if they intended to keep on their vaccinator for another year, I should have provided for the vaccinator at the time, but receiving a reply to the effect that they intended continuing the grant, I kept the vaccinator at his place. With reference to the reduction in the Tehree staff of vaccinators, I regret to say this is a most serious blow to the efficiency of this department, as it is on this staff of vaccinators that I am dependent for my supply of hill lymph, and, owing to the unhealthiness of the interior of the hills in the rains, it is of the greatest importance to have two vaccinators ready to replace the two at work there should either of them fall sick, and now I have only one available. Since writing this the oldest of these three has been obliged to resign from weak health, brought on from repeated attacks of fever while in the interior during the rains. I am thus left with two vaccinators of only a season's instruction each, to collect vaccine lymph for next season's operations, as some time must elapse before the last-appointed vaccinator can be trusted with the duty of filling tubes. The vaccinators on the Tehree vaccine establishment are more highly trained than any of the others, as they have to fill tubes

in such a manner that the vaccine lymph is not rendered inert in the process of filling or closing them. I most earnestly trust, therefore, that if the Rajah of Tehree is unable to meet the expense of a fourth vaccinator, which is only Rs. 60 in addition to the Rs. 600 allowed, that the Government will be pleased to sanction it. The total allowance for the Tehree staff of four vaccinators and one Native Superintendent was on its first establishment Rs. 660, and the withdrawal of Rs. 60 has compelled me to dispense with one vaccinator.

Revaccination.

9. A reference to the returns will exhibit the circumstance of the revaccination column in Statement No. I.* being left blank, and I therefore feel that some explanation is required on the subject. The term revaccination is described in the foot-note of Statement No. I.* by the Sanitary Commissioner with the Government of India as follows:— "That is to say, "vaccination of persons who have been either previously "vaccinated with success, or have been inoculated, or have "had small-pox." Now, with all deference, I would suggest that this definition is incorrect in two out of the three instances in which it is employed. I allude of course to the two latter, for how can a case be *re*vaccinated of which there is no record or mark of a primary vaccine operation. Further, the use of the term is also apt to lead to grave errors in the conclusions which may be arrived at with reference to the results notice in the revaccination column. For instance, successful revaccination, owing not unfrequently to what really might have been defective primary vaccination, though supposed to be successful, is common enough; but a very different result is met with when the operation is performed on an inoculated case, or one that has had small-pox; and thus the revaccination column should be kept for revaccinated cases according to the recognised definition of the term in Europe, so that it may be possible to compare the results, such as they may be, with similar ones in the countries of Europe.

* Not printed.

Independent of the above, it is surely not argued in favour of vaccinating inoculated cases, or those that have had small-pox (as the operation cannot be termed revaccination), that vaccination if really successful, which by the way is far from a common occurrence, as stated before, can impart an immunity from small-pox greater than that already enjoyed by these cases, from either a spontaneous or inoculated attack of the disease. The necessity, therefore, of operating in these cases is, to say the least of it, very doubtful. Further, the villagers generally where vaccination has been practised to any extent are perfectly well aware of the fact that it is had recourse to to prevent an attack of small-pox, and it would be expecting too much to suppose that they are ignorant of the fact that one attack of the disease gives immunity, as a general rule with but rare exceptions, from another. The suspicion, therefore, alluded to in para. No. 14, regarding the supposed object of the Government in the present scheme of gratuitous vaccination, would, in their ignorant and suspicious minds, have some foundation, if they saw *all* the people in a village vaccinated without reference to small-pox or inoculation; and if I was asked by one of the villagers why I vaccinated a case profusely marked with small-pox, I know of no satisfactory answer which I could give, and this would only make matters worse. Again, if the column has been inserted for the cases which could alone be those of revaccination, then the seven years which it is generally considered should elapse before the second operation ought to be performed have not yet expired under the present scheme; and, supposing they had, I should think that revaccination in the strict sense of the term ought not to be thought of as far as the operations of the vaccinators in the villages are concerned, till the thousands unprotected by even a successful primary vaccination are immensely reduced in numbers. After what I have recorded, I need hardly add that no revaccinations of any kind have been performed during the past season, and the operations performed in the jails alluded to hereafter,

happening as they did in the cases of prisoners who had been inoculated, or had had small-pox, have been entered, as they really were, under the primary vaccination column. Before closing this para., I would wish to add a few remarks regarding what, for want of a better name, I may call fictitious vaccination, as witnessed during the past season. During my tour I had an opportunity of seeing a considerable number of vaccine operations which had been performed on the prisoners in two jails in my divisions, the results of which have an important bearing on the subject of this para. The subjects of these operations were prisoners of all ages, from adults to old men, many of them deeply pitted with small-pox. In nearly all these cases there was, as might have been expected from the circumstances attendant on residence in a jail, and no preparatory treatment, more or less irritation. Of upwards of fifty on which there should have been good crusts, only four were met with, and of twenty, within seventy hours of the operations there was an amount of irritation which quite precluded the probability of a characteristic vaccine vesicle resulting. With reference to these vaccinations in the jails, I would with all deference suggest that the operations be confined to those prisoners who have no mark of small-pox or of inoculation, including, perhaps, those on whom there is a primary vaccine cicatrix, for careful experiments with a second vaccine operation. The scheme of vaccination in the North-Western Provinces being a voluntary one, it is of importance to prevent a clashing of practice within and without the jail, more especially as it is possible that these prisoners when released might circulate in their villages a report to the effect that vaccination constituted one of the punishments of the jail, and these men would certainly have the following circumstance in support of their report, *viz.*, that outside of the jails all cases of small-pox and those who had been inoculated were exempted from vaccination, while all prisoners indiscriminately were operated on. The report, therefore, alluded to in para. No. 14

might, as before stated, gain confirmation from the above circumstance.

Numbers of operations performed by each vaccinator.

10. Under this head the new form of Statement No. I. exhibits differences in the total number of operations performed by each vaccinator which demand some notice. It will be seen that in some tehseels the numbers of last season and of that under report show a strange similarity in the totals of operations performed during these two periods as regards the numbers being large and small. If, for instance, the returns in the Etáwah District are compared with those of the adjoining one of Mynpoory, a very great difference in numbers is noted; similarly, when Agra is compared with Muttra and Allygurh, and Moozuffernuggur with Meerut and Saharunpore. Now it is when making such comparisons that the real difficulty of effecting a standard for the number of operations makes itself manifest. The generally accepted number of 1,500 in the season, or 10 per diem in five months of thirty days each, is exceeded in some of the tehseels in the Mynpoory, Muttra, Allygurh, Meerut, and Saharunpore Districts, when the calculation is made on four months and Sundays excluded, and sufficiently approached in many others in these districts; but in Etawah and Agra far lower standards must be fixed as a rule. The vaccinators have been changed, and some of the best men, as will be shown by the rate of success, sent to these tehseels, but with little improvement in the totals of operations. That religious prejudice has nothing to do with it is shown by the numbers attained in Muttra; and where apathy might be advanced, as in Saharunpore, the results would not justify it. To what, then, is it owing? If caste or religious prejudice and apathy are thus removed from the category of objections, I fear the only feasible one must be an unaccountable opposition to the measure, confined to certain classes of the population, and exhibited chiefly in certain localities.

Though I write thus, I would not wish it to be understood that I consider this opposition to vaccination met with in the districts alluded to as peculiar to them, or India generally, while it certainly has this advantage in this country, that it confines itself to simply declining the prophylactic, whereas in other countries it raises an organized opposition to it, and I must say I have never met with this in my divisions. In the Etawah District a vaccinator told me he was afraid to go to a certain village, as the police had told him that the villagers had reported that one of the vaccinated children had died of the operation. Being on the spot, I made inquiries, and found out that the parents had taken the child to another village. The object, however, of this report was clearly to bring vaccination into bad repute; but, being confined to the village and neighbourhood, this report could hardly be said to have been an organized one. As long as the system is voluntary, quality, not quantity, must be the real aim of the scheme, and it is to the former alone that it must look for a firm footing: an unsuccessful case attacked with small-pox, and the disease proving fatal, shakes the faith of the villagers in the prophylactic generally, not only as regards future operations, but also with reference to those which may have been successful. The number 1,500 has been fixed as a standard for a good season's work, but if cases presented themselves this might safely be doubled, as follows:—There is nothing that I know of to prevent a vaccinator operating on 30 cases a day (and it has been done with good success), if his time was not taken up in collecting the cases; indeed, they would take longer to *record* than to *vaccinate*. Now, if this can be done, we should have $30 \times 6 = 180$ for a week: or, taking it on the 104 working days of this season as noted in para. No. 7, the season's number would be $104 \times 30 = 3,120$, and this multiplied by the 86 vaccinators in the plains, gives 268,320 for the season, or upwards of 40,000 in excess of the annual birth-rate of the Agra and Meerut Divisions. It has been suggested that even if the strength

of the Vaccine Department in the North-Western Provinces is doubled, the birth-rate even of these provinces will never be approached; but from what I have tried to show above, the real obstacle lies not in the extent of the establishment, but in the difficulty of its getting fair scope for work: not a single vaccinator in my divisions is overworked, as far as operating goes, though some may be in their fruitless journeys from village to village. In my letter No. 18 of 1871, dated 26th January, 1871, to the Officiating Superintendent-General of Vaccine, North-Western Provinces, forwarded for the information of the Government of the North-Western Provinces, I advocated compulsory vaccination within a radius of ten miles round all stations where Europeans were quartered, and within similar limits of municipal boundaries; but having during the past season discussed this subject, with reference to some of the municipalities in the Agra and Meerut Divisions, I was informed by an officer who has devoted considerable attention to the subject of municipal vaccination, that there would not be the least difficulty in making vaccination compulsory within municipal boundaries. The only obstacle which he suggested was on the score of the possibility of one or two vaccinators protecting the numbers which would require the operation. I think, however, I satisfactorily met this objection. This plan was to notify that the municipality has appointed a vaccinator of their own, who would attend daily at a notified locality, and that his services would be available gratuitously for the unprotected portion of the poorer classes. Those who objected to send their children to these vaccinating stations would be at liberty to make their own arrangements for the vaccination of their children, but that this would have to be done within a certain period of the birth, or if the child was above six months, after the 1st November, and a certficate of successful vaccination produced, signed by some person qualified to give it. Judging from the class from which the hakeems and baids who have been selected by the Native gentlemen of Boolundshuhur and the district to be instructed

in vaccination are taken, I should consider no objection on the score of social position could be brought against the ordinary stamp of vaccinators in my divisions. The municipal vaccinator could therefore attend at the house of the better class, and for this extra work he would undoubtedly be entitled to a small fee for each successful case, which I may mention is very frequently tendered under the present system, which the vaccinator is allowed to retain on reporting the circumstance to me. I always mark these cases with approval, as there can be no better proof in this country of a benefit having been conferred than when a pecuniary reward follows it. I would allow one municipal vaccinator to every 100,000 of the population, and, as no time would be lost in going from village to village, this man could with a little extra exertion for the first year or two protect the population requiring vaccination above a year old, and subsequently the annual birth-rate could be easily kept under protection. The only difficulty which I can think of would be with reference to the seven non-vaccinating months, but the risk to the children born between the 1st November and 1st April would be immensely diminished if these children were the only cases liable to small-pox.

Animal vaccination.

11. With reference to letter No. 4655A. of 1870, dated the 9th November, 1870, from the Government of the North-Western Provinces, a copy of which was supplied to me, I regret to say that, owing to my having been on tour from the end of October, 1870, to the present time, I have had no opportunity of making any experiment on the subject of animal vaccination: the observations which I am about to make are merely the result of studying the subject by means of the published articles and reports on it. The report of the Medical Officer to the Privy Council, and of the medical officers deputed to make inquiries into the subject, are far from favourable to the scheme. The Medical Officer to the Privy Council, in his twelfth report

to the Council, at page 38, writes as follows:—"Facts stated "in Dr. Seaton's report show most clearly that the system as "at present understood has certain great disadvantages, and "these in my opinion are of such kind as at present entirely "to forbid an adoption of the system in place of our own, unless "on independent grounds our own already deserved to be "condemned." Mr. Simon, the Medical Officer to the Privy Council, then goes on to refute the charges brought against the supply of vaccine lymph in circulation in England, of imparting syphilis among the cases operated on; but as this is foreign to the subject of the necessity of animal vaccination, in the Bombay Presidency at least, where the entire Vaccine Department have recorded their experience of never having met with a case of syphilis traceable to vaccination, it will be unnecessary for me to enter into it in detail here. With reference to animal vaccination as met with in Bombay, however, the case is different, and I would take the liberty of making a few remarks regarding it, as contained in the reports of Dr. Blane and Assistant Surgeon Anunta Chandroba, and I may mention that they are based on the inquiries conducted by Dr. Seaton on the Continent:—

1*st*,—What necessity exists in the Bombay Presidency for having recourse to animal vaccination?

2*nd*,—Judging from Assistant Surgeon Anunta Chandroba's report, supposing the necessity to be established, would it be possible to carry out the scheme in this country in such a manner as to improve on the present practice of vaccination in India, either as regards numbers or rate of success?

As regards the first question, Assistant Surgeon Anunta Chandroba virtually answers it by stating, in the conclusion of his report, that animal vaccination "has proved a "perfect boon to Bombay in one particular," *viz.*, by animal vaccination now providing "the means of producing a supply "of lymph the purest and most effective to an unlimited extent." The "*purity*" of this lymph may be undeniable,

but as to its being "*most effective,*" the returns of the Bombay Presidency, where the rate of success is taken in circles, prove it to be more than 11 per cent. *less effective* than the *worst* vaccine lymph in circulation, and 15 per cent. more inefficient than the best. Dr. Blane's record of the condition of the vaccine lymph in his circle, as given at page 25 of the Bombay Vaccine Report for 1869-70, undoubtedly seems to leave room for vast improvement under this head, but this vaccine lymph, nevertheless, in upwards of 45,000 operations, realized a percentage of success of upwards of 96·1, which is more than 12 per cent. higher than the animal lymph could attain, even under the careful manipulation of Assistant Surgeon Anunta Chandroba himself. With reference to Mr. A. Chandroba's experiments, one important proof of the superiority of good humanized lymph over the ordinary, or even superior quality of animal lymph is wanting.

In all Mr. Chandroba's experiments, no mention is made of the employment of humanized lymph when the animal lymph had failed; had he done this he might have met with the results witnessed in Rotterdam in 1869, when the following was noticed:—

	Successful.	*Unsuccessful.*	*Total.*
Cases of vaccination with animal lymph, ...	550	87	637
Cases of vaccination with humanized lymph, ...	666	5	671
		Total, ...	1,308

With reference to the above, Dr. Seaton writes as follows, at page 187 of the Twelfth Report of the Medical Officer to the Privy Council; and, as it is both full and, I think, conclusive, I offer no apology for the long extract I am about to make. The authority of Dr. Seaton on all matters connected with vaccination is universally allowed in England and the Continent to be of the highest order, and animal

vaccination must be much improved before it can ever lay claims to supersede the system of vaccination in force in England, and with some modifications adopted in this coun- "try:—The 1,308 cases of vaccination recorded in this table "[the one I have given] were performed on 1,230 individuals; "the unsuccessful cases being vaccinated a second, and such "as required it a third time, so that all the children were ul- "timately successfully vaccinated. The second vaccinations "were done either with animal lymph or with humanized "lymph as the case might be; but for those cases in which "animal lymph failed twice, only humanized lymph was "trusted to for the third operation, and none of them then "failed. So far, then, as evidence at present goes, it appears "quite clear—(1) that the present degree of success attending "the practice of animal vaccination is, in comparison with "the success attendant on vaccination from arm to arm, very "low, and such as to constitute a most serious drawback to "its use, supposing that other reasons were deemed suffi- "ciently strong to render its introduction as an alternative "proceeding desirable; (2) that much training and experience "are indispensable to the attainment of even that degree of "success which at present attends it. If practised and most "scrupulously careful vaccinators, anxiously endeavouring to "make their experiment successful, and neglecting no known "precaution for that purpose, find, after two years' experience, "that in vaccinating direct from the heifer to the arm they "are obliged in one-eighth of their cases to vaccinate a second "time before they can produce any effect, and that in the "end very nearly one-fourth of the children who are infec- "ted in this way are sent out with that imperfect degree "of protection against small-pox which is afforded by only "one or two vaccine vesicles, it must, I think, be obvious, "that by the adoption of such a practice we should be greatly "weakening our defences against small-pox. The chance "to each individual of a full protection would be very "largely diminished, and the danger to the community of

"spreading small-pox greatly increased, by the number of "half-protected persons thrown upon it. We should be going "back in fact towards the state of things, which, from other "causes, existed a few years ago, and from which of late "years so much has been done to rescue us."

As regards the second question—*viz.*, the practicability of the scheme in this country—I will take for example my own divisions. Any one who is acquainted with the duties of a Superintendent of Vaccine in the North-Western Provinces will at once see how disastrous the results would be to the Superintendent's tour of inspection, by which he keeps a check on the veracity of the returns, &c., if that officer were to halt at a large city, and commence animal vaccination. To continue the illustration from my own case, he would have to keep 89 vaccinators, scattered over a distance of upwards of 500 miles, or from the borders of the Cawnpore District to the snowy range between the Ganges and Jumna, supplied with sufficient lymph for an average of ten cases per diem, for four months at least; and, if the greatest difficulty was experienced in Bombay in keeping up the relay of calves, I fear this would be immensely increased in the North-Western Provinces, with its Hindoo population: and without these means of collecting the lymph, the scheme in its present state would fall to the ground. Further, this animal lymph, in the most experienced hands in Europe, stores and carries badly, and often proves very uncertain. While on the subject of the quality and quantity of the humanized lymph, as met with in India generally, necessitating or not the introduction of animal lymph, I would merely mention that during the past season I have not, from the 1st November, 1870, to the 11th March, 1871, met with in the course of my inspections a single instance of either scarcity of vaccine lymph, necessitating suspension of operations when the vesicle was fairly established in November, 1870, or its showing signs of deterioration till the 2nd week in March, 1871, with the exception, as regards the latter, of what I

have in para No. 9 termed fictitious vaccination in two jails alluded to. Two careless and inefficient vaccinators had let the supply of vaccine lymph get very low, which led to their dismissal; but the new men from, it might be, a few good vesicles, aided with a little lymph on points from the vaccinator in the next tehseel, soon restored the supply to its proper amount. Scarcity of subjects willing to submit to the operation, and not an ample supply of good vaccine lymph, is, and has been, the great drawback to the extension of the present voluntary scheme; and yet, notwithstanding this limited supply of cases, vaccine lymph is always available, in the event of an outbreak of small-pox in a village, for 20 or 30 cases a day, and after a week or ten days for four times the above figures if necessary.

Small-pox.

12. During the past season small-pox cannot be said to have been very prevalent in any portion of the Agra and Meerut Divisions. There were a few cases in the Muttra District, and in that of Saharunpore, where it chiefly occurred at Deobund. I had an opportunity of seeing the mortuary returns of one district, and though they exhibited what must have been a considerable outbreak of small-pox, yet no report of it was sent to me by the Native Superintendent of the district, though I had written to all the Superintendents of Police in my divisions, requesting the favour of their issuing orders to their subordinates in charge of mortuary circles, to report at once to the nearest vaccinator, by whom it could reach me through the Native Superintendent, any cases of small-pox occurring within their circles, with the view of the vaccinator taking advantage of it to try and induce the villagers to accept the prophylactic, and test its benefits then and there. If I may judge by the reports of small-pox, which I have received, I must look on the past season as one peculiarly free from small-pox even in a slightly epidemic form. When small-pox has been reported, a vaccinator has been sent at once, and the Native Superintendents have

standing order that, no matter what the extent of the outbreak may be, they must proceed at once to the spot, with lymph collected from the operations of any vaccinator through whose beat they may pass, and use every means in their power to protect all the cases requiring it in the village, beginning in the neighbourhood of the infested house. I may mention that both Native Superintendents and vaccinators are, so to speak, on the look out for the disease, as its presence adds weight to their powers of persuasion, and generally ends in a good weekly or monthly return.

Hakeems.

13. During the past season, I have been able to make a commencement in what I hope will prove a great aid to this department —I allude to enlisting the sons or nominees of the better class of hakeems and baids as candidates for instruction in vaccination, which I am in hopes they will carry on in the families of their patients, and those of the better classes to whose houses they have the *entrée*. I have to acknowledge my best thanks to Mr. Ward, Joint Magistrate of Meerut, and Mr. Willock, Magistrate of Boolundshuhur, as also to the several Dispensary and Municipal Committees in the Boolunshuhur District, for the kind assistance they have rendered to me in trying to place this important project on a firm basis. Mr. Ward's first experiment with the municipal hakeem vaccinator at Baghput was not very successful, yet a failure or two at first should act only as beacons to avoid the dangers that caused them, and not lead to giving up the project. While at Boolundshuhur, I had several applications from the sons of hakeems for leave to study vaccination, but as they applied at the close of the season, their instruction was obliged to stand over till the next, though I supplied them at once with the vaccine pamphlet and copies of the forms in use in the department. I am particularly anxious that these applicants should be thoroughly taught before they are permitted to vaccinate, as much of their future success, and, indeed, of this branch of the present scheme, will depend

upon their thoroughly knowing their duties theoretically before entering on them practically. I am in hopes that through these hakeem vaccinators I shall be able to reach the children of the class of the community above alluded to, as vast numbers of them are, I fear, unprotected.

Inoculation.

14. As this subject is noticed in column No. 8 of Statement No. V., I may make a passing allusion to it here, though merely to say that the practice of inoculation has, as far as I can hear, entirely departed from my divisions, never, I hope, to return. Having on two separate occasions fully discussed the subject of inoculation, in most if not all its bearings, from personal observation, once in 1867, when the report was submitted to the Government of the North-Western Provinces, and again in 1870, when it was sent to the Inspector-General of Hospitals, H. M.'s Indian Army, I will not re-open the subject here, except to state that the practice seems to have been confined to the Himalayan portion of my divisions and Dehra Doon, and also to the northern parts of Saharunpore; and, if I might take the facility with which vaccination has superseded it in Tehree, Ghurwal, and Dehra Doon as a test, my only regret is that inoculation was not general in my divisions, as I think it must be allowed that where it is practised a great deal of ground is gained, as it proves the fact of the population virtually acknowledging the necessity of some prophylactic against small-pox other than religious festivals and observances. Here it may not be out of place to allude to the festival called the "Seetlah Poojah." "Seetlah," as is probably known, is the name of the goddess who presides over small-pox, and in many districts "Seetlah" is the only name for this disease. At these "Seetlah" festivals, cases of small-pox in every stage of the disease are to be met with, and not unfrequently deputations are to be seen which have come from the neighbouring villages, with gifts, &c., for the shrine, in the hope that the goddess will accept them, and spare their

villages from the fatal disease; but, alas! the reverse is too often the case, and these unfortunate people carry back the poison of disease to their villages, and thus innocently are the means, not only of bringing the scourge to their own villages, but of spreading the infection over the country. I would, therefore, suggest that orders be issued, prohibiting, under certain penalties, the custom of taking cases of small-pox, no matter at what stage of the disease, to these "Seetlah" festivals, or, indeed, among any other large concourse of people. Steps are taken by the authorities, under the orders of the Government, to prevent loss of life at Hurdwar, Juggernath, &c., during the celebration of the religious festivals at these places, and this interest is, generally speaking, exhibited on the behalf of those who are or ought to be capable of taking care of themselves. I trust, therefore, that the poor innocent children for whom I plead will not be denied their share of the protection which the Government has extended to the fully responsible devotees at Hurdwar, Juggernath, &c. No alarm need be felt on the score of interference with either a religious prejudice or ceremony, if any conclusion may be drawn from the case of the car of Juggernath, which has for years been surrounded with nets, to prevent the devotees being crushed under the wheels. On one occasion, when I was at Juggernath, these nets were the means of preventing what otherwise might have been an immense loss of life; and yet, I never heard that sanctity of the car was injuriously affected, or the procession robbed of any of its accessories, except, perhaps, being deprived of what I once witnessed, *viz.*, a few mangled bodies on the road. It is true that, as a rule, these "Seetlah" festivals affect the innocent infant population chiefly, but in a country like this, when for nearly two-thirds of the year there is no known method of protecting the young children from small-pox, they must become, I should consider, alike dangerous to European and Native children, especially when these festivals are held near a large cantonment like Agra, as I witnessed in the hot

weather of 1864. Nothing is considered too minute to be noticed, or to be acted upon, if it will tend in any way to prevent an outbreak of cholera, while a gigantic centre of contagion like the "Seetlah" poojah at Agra is allowed to diffuse its poison broadcast over the country.

General remarks.

15. Having discussed so fully in separate paras. many of the subjects to which I intended to allude in this, it only remains, therefore, to mention one or two circumstances met with in the course of last season's tour. The state of the water in the wells in encampments, and on the Grand Trunk and other main lines of road, has long attracted my attention, and in November, 1870, when encamped at Khoorjah, I had an opportunity of discussing the subject with the Commissioner of the Meerut Division and the Magistrate of Boolundshuhur, who were both of opinion that my suggestions to purify these wells, and to keep up a supply of fresh, and, hence, pure water, were quite possible. I therefore recorded them in a letter, No. 335, dated 21st November, 1870, to the Commissioner of the Meerut Division, and sent a similar one to the Commissioner of the Agra Division. I am aware that this subject is foreign to vaccination, and my only reason for alluding to it is, that among a wandering population like that of the North-Western Provinces, whose only drink is water, the purity of this important commodity cannot but be of the greatest value in a sanitary point of view; and now that modern research has shown what a vehicle of disease impure water may become, I trust my digression under this head may be excused. Under the present voluntary system, great difficulty has been experienced in protecting, as far as possible, a given tract of country before leaving it for another; before next season, therefore, I purpose applying for Vernacular maps of the district for each Native Superintendent, and if I can get the tehseels copied separately, I will furnish each vaccinator with one of his own tehseel. The object of this is for the Native Superintendent to mark the villages in his own map in which operations have

been performed, which he can easily do by the weekly returns, and he will thus be able, not only to note any which may have been omitted, and ascertain the cause on his next inspection, but will know also the exact spot where to find the vaccinator on a given date when he goes to record the results of the operations noted in the weekly return "without results," which is forwarded to him on the evening of the day completing the week. If each vaccinator has a map of his tehseel, he will be unable to advance the excuse, not unfrequently given, that he did not know that a village lay in such and such a direction, and therefore did not visit it. Agreeably to the orders of the Government, I have despatched monthly to the Magistrates of the twelve districts in my divisions, a return of each establishment and municipal vaccinator's operations for the month; and before the commencement of the season I addressed a letter to each of these officials, in which I mentioned that the object of sending these returns was in the hope that the Magistrate of the district, or any other officials connected with it, would, if opportunity offered, test the correctness of these returns, which would answer the double object of placing an additional check on false returns, and show to the villagers the interest which the Government, through their officials, took in the scheme. Whether these returns have been thus tested or not I am unable to say, but I have received no report throwing doubt upon their veracity. During the past season I heard a strange objection brought against the present scheme of vaccination, which is only deserving of notice from its absurdity, though it tends to show how strangely most opposite circumstances apparently are taken to prove a statement. The objection was, that the Government in circulating vaccination gratuitously was, in addition to conferring some supposed benefit on the infant population, indelibly marking them—the object of the latter proceeding being to obtain some data for future taxation. My visits of inspection, therefore, among these villagers may be viewed by them, not with reference to the supposed benefit conferred, but to the perma-

nency or otherwise of the marks made. The natural result of refusing vaccination in these cases would therefore be, that the fewer the marked children the lighter would be the taxation; the carefully recorded results left in the villages, and entered in the vaccinator's diary, would, if the circumstance of the benefit were doubted, tend to strengthen the belief that the real intention of the Government was with reference to some future action. I have said above "opposite circumstances," as nothing could be more opposite than vaccination and taxation, the one being purely optional, and the other compulsory by heavy legal penalties; and this, of course, was the answer to these objections. I am happy to state that the above objection was broached in only one district out of the twelve, and, strange to say, this was in Meerut, and in the adjoining tehseel to that in which the story of the search for the child with milk instead of blood originated. With reference to the castes of the cases operated on, there cannot be a doubt that, as a rule, vaccination is carried on most extensively among the lower castes; and as these seem to be entered in the mortuary returns as "other classes" though Hindoos, from their not being Brahmins, probably, it would be interesting to note, were it possible, if these lower-caste classes in the villages enjoy an immunity from small-pox from which the Brahmins and higher castes are exempt. In conclusion, I would beg to bring to the notice of Government the name of Thakoor Koomar Jugmundo Singh, of Budwas, in the Etah Zillah, to whom I am greatly indebted for the extensive operations of the vaccinator in the district in which some of his villages are situated: also to the Tehseeldar of Kalsee, who has taken considerable trouble in explaining the scheme to the villagers in the Jounsar Bawar District; and the numerous operations of the Kalsee vaccinator are due not a little to the good services of the Tehseeldar in question. I need not particularise by name other Government officials who have, while on tour in their districts, said a good word for vaccination; their best reward will be in the knowledge of their having done their

best to extend to the ignorant villagers under their official protection the benefits which they and their families enjoy. As regards my Native Superintendents, I would beg to recommend for some mark of approval Native Superintendent Toolsee Ram of Dehra Doon. In April last year, when the conduct of the Native Superintendent of Tehree led to his dismissal, and my supply of lymph for the operations of the past season seemed doubtful, Native Superintendent Toolsee Ram at once volunteered to accompany me into the interior, and do the duties of Native Superintendent during the hot and rainy seasons, thus giving up his holiday. The mode in which he performed his duty, and stuck to his post when his vaccinators were down with fever, owing to the rains being not only unusually heavy but late, was worthy of the son of an old Ghoorka havildar; and though he had permission to come into Mussoorie in August or September, he did not return till the end of October, and brought with him the supply of lymph alluded to in para. 2. I have no means of pecuniarily rewarding any of my establishment, and as Toolsee Ram is a Native Superintendent, and merely drew the battah of the dismissed Native Superintendent, I therefore trust the Government will notify, in any way they think best, their approval of his zeal for the public service.

[**No. V.**]—*Appendix to the Annual Report of the Vaccine Operations in the Agra and Meerut Divisions for the Season* 1870-71: *by* SURGEON R. R. PRINGLE, M.D., *Supdt. of Vaccine, Agra and Meerut Circle, dated Mussoorie, 29th April,* 1871.

WITH reference to the reduction in the Tehree staff of vaccinators, alluded to in para. 8 of the annual report, I am glad to say that it has proved to be only temporary, having been caused by a doubt as to whether the full allowance would be available for the present season: this, however, having now been received, the number of vaccinators has been brought up to its original strength, *viz.*, 4. I may here mention

that vaccination seems most thoroughly to have superseded inoculation in Tehree, Gurhwal, and there cannot be a doubt that this is due, not a little, to the circumstance alluded to in my annual report of 1866-67, when the comparative merits of vaccination and inoculation were tested in two adjoining villages, when both were had recourse to prevent an epidemic of small-pox, and the victory was awarded to the former by the villagers themselves.

2. During the past season not a case of inoculation has been reported to me, and small-pox, even in the slightest form of an epidemic, has not been witnessed. I should, however, be withholding praise where it is due if I omitted all mention of the name of the Rajah of Tehree, Gurhwal, as without his influence and moral support these most satisfactory results would never have been attained in the few years during which I have carried on the present system of vaccination in his territory. On the occasion of my personal visits to the Rajah, I have not failed to mention to him how much I have been indebted to him and his durbar for the success of the present scheme of vaccination; and I trust the Government of the North-West Provinces will view his good offices in the same light, and convey to the Rajah some expression of their approval of his conduct, and of the liberal grant he makes annually towards the support of the vaccine establishment in his territory.

3. I wish I could add the names of any of the other wealthy landholders in the Agra and Meerut Divisions as following the good example of the Rajah of Tehree, and not confining their support of vaccination to saying a good word here and there in its favour, but by giving some tangible proof of their belief in it by a pecuniary grant towards its support. This would show to their dependents their faith, at least, in the scheme, as it is always something to be able to point out to a Rajpoot villager that his acknowledged head believes in the scheme, or he would never aid it by a grant of money.

AJMERE CIRCLE.

[No. VI]—*From* T. MURRAY, ESQ., M.D., *Civil Surgeon and Supdt. of Vaccn., Ajmere, No.* 59, *dated Ajmere,* 20*th April,* 1871.

SIR,—I have the honour to forward returns of vaccination in this district for the season ending 31st March, 1871:—

The following is the establishment for this district:—One Native Superintendent and four vaccinators paid by the State, two vaccinators paid by the Municipalities of Ajmere and Beawur, and one vaccinator paid by the Thakoor of Massudah.

The total number vaccinated was 8,698. Of this number there were—

Successful,	...	...	...	5,996
Unsuccessful, including doubtful,			...	1,453
Unknown,	...	...	...	1,249

One vaccinator was sent with the Deputy Commissioner, and one with the Assistant Commissioner, on their tour through the district, and a great many of the cases vaccinated by them are entered under this latter head, "unknown," as in marching through the country they were not always able to ascertain the result of their operations.

Seven vaccinators are by far too few for a district like Ajmere and Mhairwara; there ought to be ten vaccinators at least.

The population of the Ajmere and Mhairwara Districts is entered at 426,268; but this is according to the census taken in 1864: the famine of 1868-69 has probably reduced this number by 100,000.

The Native Superintendent was unfortunately on the sick list with fever and dysentery during half the working season. I was therefore deprived of his services during this period.

Much prejudice continues to exist in the Native mind on the subject of vaccination among many of the Hindoos. The fear of offending the goddess of small-pox is very great, and prevents them from getting their children vaccinated.

With regard to inoculation, I have made strict inquiries throughout the district, and I find that it is not practised in this part of the country.

[No. VII.]—*From* C. A. ELLIOTT, ESQ., *Offg. Secretary to Government, North-Western Provinces, No.* 4240½*A., dated Nynee Tal, the 23rd September,* 1871.

I HAVE received and laid before the Lieutenant-Governor the Annual Report and Returns of Vaccination in the North-Western Provinces for the season of 1870-71, submitted with your letter No. 62, dated 8th May last, and am directed in reply to communicate the following remarks and orders.

2. The results of the season's operations may be thus shown:—

Circle.	1870-71. Population.	Number of vaccinators.	Number of cases.	Successful.	Percentage to population.	1869-70. Successful.	Percentage to population.
Kumaon and Gurhwal.	634,532	13	28,537	23,903	3·7	21,334	3·36
Rohilkhund, ...	5,166,071	43	78,040	63,872	1·2	67,290	1·11
Agra and Meerut.	9,262,911	89	87,836	72,239	0·77	76,467	0·82
Allahabad and Jhansie.	*5,519,336	†97	†64,804	†42,854	*0·64	37,298	0·67
Benares, ...	9,030,736	35	43,672	36,406	0·4	28,745	0·32
Ajmere, ...	426,268	7	8,721	6,088	1·4	6,164	1·45
Total, ...	30,039,854	284	311,610	244,862	*·79	237,298	0·79

* Excluding Native States. † Including Native States.

There is an increase of 7,564 successful cases as compared with last year, and the number of operations is larger than has been recorded in any year except 1868, when the great small-pox epidemic caused very general recourse to be had to the prophylactic. There is also an improvement of 10·0 per cent. in the proportion of successful cases to the total number of

1869-70,	...	... 84·7
1870-71,	...	... 85·7

vaccinations performed, deducting the cases (19,429), the result of which is unknown. On the other hand, there were 24 more vaccinators entertained during this year than last, making 284 in all, which reduced the number of primary vaccinations per man from 1,151 in 1869-70 to 1,077 in 1870-71.

3. Three causes of this decrease are pointed out. One is referred to in your 3rd para, *viz.*, the introduction of the new postal rules, which interfered with the circulation of lymph among the vaccinators at the beginning of the season. This was a curious and unexpected result of what was meant to be an administrative improvement, and your remarks on this subject will be communicated to the Director-General of Post-offices. Another is doubtless to be found in the more careful testing of the returns by the Superintendents of Circles. A third is the fact that the increase in the vaccinating staff consists chiefly of men employed in the Native States of Bundelkhund, who are not as yet sufficiently supervised, and whose work is not up to the general average.

4. Assuming the birth-rate at 40 per thousand, there are 1,200,000 children born every year in the North-Western Provinces. Reckoning that each vaccinator can perform 1,500 operations a year, a staff of 800 men, or more than double the present number, would be required (supposing the population favourable) to secure perfect protection from small-pox. This is a strength which, in the present state of finances, the Department can hardly hope to reach, but it is a standard which

should be kept constantly in view. If the charitable efforts of Native gentlemen and of municipalities continue to be directed to this end, the Lieutenant-Governor on his part will not be slow to meet them half way, or more than half way, so far as the provincial revenues admit of this being done.

5. The number of deaths from small-pox registered during the year 1870 is shown in the Sanitary Commissioner's report as 23,564, or ·79 per 1,000 of the population. The ratio of deaths to persons attacked by the disease is not accurately known; but if the proportion of deaths be assumed at about 12 or 13 per cent., this would give about 200,000 cases of small-pox during 1870, or less than the number of successful vaccinations performed in 1870-71 by 44,862. The use of the prophylactic has not reached very far when the number protected by it hardly exceeds the number protected by having undergone the disease itself.

6. Of the staff employed 188 of the vaccinators were paid by Government, 46 by municipalities, and 50 from local or private sources. The last class have increased by 23 in the year under report, chiefly in the Agra and Meerut Circle and and in the Native States of Bundelkhund. The average number of successful operations per man for the whole staff was 854·4. The average for Government vaccinators appears to be about 925, and for those entertained by municipalities 942, but the statements are not drawn up with sufficient uniformity and precision to enable these figures to be stated with accuracy. It appears, however, that the vaccinators entertained by municipalities are, as a rule, well supervised and diligent in work. Still, a greater difference in the number of operations might have been expected, since in large towns, the subjects lie close at hand or within easy reach, while the district vaccinators have to spend a large portion of their time in travelling in search of the children to be operated on.

7. Considerable variations are also observed in the average number of operations performed by each vaccinator in the different circles. In Rohilkhund this was 1,801, in Agra and Meerut 986, in Allahabad 671, and in Benares 976. Thus in Rohilkhund each man did twice as much work as in the Meerut or Benares Circle, and nearly three times as much work as in Allahabad. Some attempt is made in the report to account for this, but it is not very satisfactory. The explanation given is simply that the character of the people varies in different districts. I am to request that the subject may be more thoroughly investigated next year.

8. The average cost of each successful operation has been 5 annas 3½ pies, being 3½ pies more than last year. The greater part of this consists, as you remark, in the pay of the supervising establishment, the maintenance of which is part of the North-Western Provinces system. His Honor is satisfied that this department is managed with due regard to economy.

9. His Honor observes with much gratification the record of the services rendered by the Kumaon Depôt in the supply of vaccine virus to medical officers in other provinces. Fresh virus from the cold regions of the Himalayas is shown by you to be more efficient than that imported from Europe: and in these hills the North-Western Provinces possess an inexhaustible storehouse of the prophylactic, which, as facility of communication increases, will doubtless prove of the greatest benefit to the whole Empire.

10. The system of inspection described by you in the 9th para. of the report involves considerable personal exertion and labour, but the result in ascertaining the extent of actual success, and more especially in keeping the vaccinators on the alert, well repays the labour and trouble. You have shown clearly how necessary it is that the work done by the vaccinators should be constantly and vigilantly supervised by European Inspectors or trustworthy Native gentlemen. The reports of Dr. Milne in the Benares Circle and Dr. Richardson in Allahabad

are evidence to how great an extent returns are liable to be falsified by ignorant or fraudulent subordinates. This is one great difficulty in the way of ascertaining the progress of vaccination in this country.

11. His Honor observes with pleasure the interest taken by several Magistrates in vaccination in their districts. Were these officers and their subordinates while on their tours occasionally to devote a few hours to inspecting the work of the vaccinators in the way now practised by the Superintendents of Circles, the gain to the Department would be great. Civil Surgeons might also, without inconvenience to themselves, inspect from time to time the work done by vaccinators in municipalities and in the vicinity of the sudder station of the district.

12. The experiments made with animal vaccination during the year have not tended to any very hopeful or decisive result. They should, however, be prosecuted as opportunity offers; and His Honor will await with interest the result of those which you propose to make with Dr. Milne's assistance at Almorah during the current autumn. I am, however, to observe that all such experiments should be conducted with the utmost caution with reference to the prejudices of the people; any serious offence in this respect might be followed by lamentable effects in alienating the people from the use of the lymph.

13. With respect to the use of ivory points in lieu of arm-to-arm vaccination, I am to say that the Lieutenant-Governor agrees with you in considering that it will be desirable still to continue the former practice, even though it be generally less effective than the latter, in cases where the prejudices of the people demand it. The establishment must use their discretion carefully in this respect. Everything should be studiously avoided that would render the people less favourable to vaccination, or offend their ideas and feelings in respect of it.

14. The Lieutenant-Governor has in a separate communication approved of the suggestion made in your 7th para., that the whole of the Rs. 500 entered for inoculators in the budget for the current year should be allotted to the Benares Circle. His Honor hopes that much good will result from the experiment, which should be prosecuted wherever there is fair opportunity for doing so.

15. The addition of two vaccinators to the establishment of the Kumaon Circle, as recommended in your 8th para., is also sanctioned, provided that the cost can be met out of your budget allotment for 1870-71. But with reference to this proposal, and that noticed in the preceding para., I am to observe that such matters should have been submitted separately for the orders of Government, and not embodied in the annual report.

16. The assistance given to vaccination in the Bundelkhund States attached to the Allahabad and Jhansie Circles is most gratifying, and the large number of additional vaccinators entertained by these States during the season under report forms one of its most favourable features. His Honor will have great pleasure in conveying his acknowledgments to Dr. Stratton for the aid given by him in this respect. The benefit must be great, not only to the States themselves, but indirectly to our own districts, in reducing the chances of infection spreading to them. Colonel Daly will also be requested to convey the thanks of the Lieutenant-Governor to the Rajah of Teekumgurh for the hearty support given by him to the cause of vaccination.

17. His Honor agrees with Dr. Richardson that it is extremely desirable that a Native Superintendent should be entertained specially for the supervision of vaccination in the Native States of Bundelkhund, and this will be suggested to Dr. Stratton. It is impossible for one man efficiently to

supervise the operations of 43 vaccinators scattered over a wide extent of difficult country, both British and Native. At the same time, the value, and indeed the absolute necessity of close supervision is amply shown by the facts stated in your report and those of your Superintendents.

18. The Lieutenant-Governor has great pleasure in requesting you to convey to the gentlemen* mentioned in your 14th para. the thanks of Government for the interest taken by them in the extension of vaccination, and he trusts that the numbers of the Native gentlemen who so interest themselves will rapidly increase. His Honor regrets that notwithstanding the exertions of the leading residents of Bareilly, the results of vaccination in that city have not been so favourable as elsewhere. The subject should be pressed on the attention of the Municipality, and it is to be hoped that the efforts of the gentlemen named by you will eventually overcome the backwardness of the population.

* *Agra Circle.*

The Rajah of Tehree, Gurhwal.
The Tehseeldar of Kalsee, Jounsar Bawur.
Thakoor Koomar Jugmundo Singh, of Budwas in Etah.

Benares Circle.

Oudh Beharee Lall, Tehseeldar of Nuggra, Zillah Azumgurh.

Allahabad Circle.

Mudud Ally Khan Bahadoor, Tehseeldar of Mejha, in Allahabad.
Kifayut-oollah Khan, Tehseeldar of Karakut in Jounpore.

Rohilkhund Circle.

Rai Bukhtawur Singh, Sub-Judge Bareilly.
Moulvie Khyrooddeen Ahmed, Deputy Collector, Bareilly.
Lalla Luchmi Narain, banker, Bareilly.
Wajeeboollah Khan, Mohullah Julalnuggur, Shahjehanpore.

19. The Lieutenant-Governor also desires to record his sense of the ready support given to the Department by His Highness the Maharaja of Vizianagram, who has this year added a second vaccinator to the one formerly entertained by him.

20. His Honor has been pleased to approve of your proposal to give gratuities, amounting to Rs. 100 in all, to the five Native Superintendents whose names are given in the margin.

Toolsee Ram, ... Dehra Doon.
Nubbi Bux, ... Cawnpore.
Rujjub Ally, ... Humeerpore.
Ally Hussun, ... Jounpore.
Puddum Niddhie, ... Goruckpore.

21. Vaccinators are now entertained by most of the larger municipalities and many of the smaller ones. The duty of furthering vaccination is incumbent upon them under the Circular Order of Government No. 9A., dated 3rd April, 1871, and is constantly enjoined in the Government orders on their budgets. This should be followed up by the Superintendents in their several circles by the exercise of personal influence and persuasion wherever the municipalities appear backward in the appointment of vaccinators. Great results may be looked for from the increase, especially in the large cities, of these vaccination establishments, which in the working season might be temporarily strengthened; and the Lieutenant-Governor thinks that the services of the various Civil Surgeons might also with great prospect of success be enlisted to aid in supervising the work.

22. In conclusion, I am to convey to you the thanks of Government for your interesting report and the punctuality with which it has been submitted. His Honor's thanks are also due to the Superintendents of Circles. Their reports give ample proof of the assiduity and zeal with which they have prosecuted their duties during the past year. To yourself the Lieutenant-Governor desires that his acknowledgments may be specially conveyed for your able conduct of the duties of the office during Dr. Pearson's absence. The Department under your guidance is performing a great and useful work, not only in the direct protection afforded by its operations, but also in gradually breaking down prejudices against vaccination and leading the people to appreciate its advantages.

The best proof of this is the increasing number of vaccinators entertained from local and private funds and by municipalities; and His Honor thinks that in the results of the year's operations there is ample encouragement to redoubled exertion for the future.

23. The issue of orders on your report has been delayed for the consideration of the proposals made by the Sanitary Commissioner with the Government of India for localization of vaccine operations within limited areas. His Honor's opinion on these proposals has been separately communicated to you; and it will be sufficient here to say that the subject was very thoroughly discussed, and that the advantages upon the whole of the existing system appeared to be so decided that the project was put aside.

Art. VI.

FLOODING OF THE TOWNS OF JOUNPORE AND AZIMGURH.

RESOLUTION No. 1517A.

REVENUE DEPARTMENT.

Dated Nynee Tal, the 25th September, 1871.

1.—THE Lieutenant-Governor has heard with grave concern of the calamity which has befallen the towns of Jounpore and Azimgurh by the rise of the rivers Goomtee and Tonse. The distress arising from the flooding of extensive portions of these towns, and the ruin of so many houses, must be very great. The information which has reached His Honor is as yet only demi-official; but he cannot doubt from what he has heard that the local authorities have been exerting themselves with the most praiseworthy zeal and diligence to save life, and in every possible way to ameliorate the misfortune. A full discretion is given to the Commissioner of Allababad and to the Commissioner of Benares (who, the Lieutenant-Governor is glad to see, has already proceeded to the scene of the disaster) to sanction such expenditure as may be necessary for this purpose. In anticipation of more detailed information as to what action and operations may be required on the part of Government, sanction is necessarily confined to these general terms. Full report is awaited.

It is hoped that the Members of the Municipalities and other leading citizens of both towns will shew their public spirit by lending efficient aid in furtherance of the efforts of the authorities.

Besides immediate operations for saving life, and making some provision for those who have been driven by the waters from house and home, two subjects must necessarily engage the attention of the authorities.

First.—Securing the efficient drainage of the flooded localities on the retrocession of the waters, and the making of such arrangements as may obviate, as far as possible, the chance of fever or other epidemic arising from malarious exhalation. Should there be any likelihood of such results, Dr. Planck, the Sanitary Commissioner, will be instructed to visit both cities, and aid in the suggestion of the proper remedies. His Honor will readily sanction the purchase of medicines, and deputation of Native practitioners, should it be found necessary.

Second.—The repair or reconstruction of public buildings damaged or destroyed by the floods; and the pulling down, or otherwise providing for the security, of walls, whether public or private, that may be in a dangerous state. The Chief Engineer has, with this view, telegraphed to the Superintending Engineer to meet any requisition made on him by the Commissioner for aid in this respect, by the immediate deputation, if necessary, of competent Engineers to the spot.

Plans and estimates for the repair or re-erection of public buildings, damaged by the floods, should be at once submitted: and endeavour will be made to provide for the early remedy of whatever damage has been sustained.

It may be feared that the unprecedented rise of these streams has inflicted injury and distress in other places along their banks besides Jounpore and Azimgurh. Information on this subject will be awaited.

2.—*From* C. A. ELLIOTT, ESQ., *Officiating Secretary to Government, North-Western Provinces, to* E. C. BAYLEY, ESQ., C.S.I., *Secretary to the Government of India, Home Department.—Dated Nynee Tal, the* 14*th October*, 1871.

A GREAT disaster has befallen the town of Jounpore, and in a less degree that of Azimgurh.

2. In the middle of September the rivers Goomtee and Tonse, on which they stand, began rapidly to rise, and continued to do so for nearly a fortnight, occasioning great loss and destruction of property, and producing, in Jounpore especially, the most disastrous consequences to the city at large.

3. The floods were absolutely unprecedented. From the 15th to the 27th September the Goomtee rose 27 feet; the entire quarter of the city on the right bank was submerged, and is now desolate; and about one-half of the city on the north has shared the same calamity. The people fled in dismay. Had the calamity been foreseen, something might, perhaps, have been done by embankments to secure the northern quarter; but the floods rose so rapidly that the people fled precipitately.

4. The Goomtee rose 18½ feet above the maximum level of last year, and 11½ feet above the highest flood of which there is any record, that of 30 years ago.

5. On the 2nd October, Mr. Commissioner Mayne writes that the subsidence of the flood was very gradual; the waters had fallen 4 feet, and the tops of the shops built over the Goomtee bridge were just beginning to be visible; after 8 days the fall was but 8 feet out of the 27.

6. The ruin has been so widespread, involving most of the public buildings and officers' bungalows, as well as nearly two-thirds of the city, that several questions of grave importance will have to be considered: such as, what portions of the city should be re-inhabited; where the Jail, which is among the ruined buildings, should be re-constructed; whether any reason exists for reconsidering the site of the Civil Station itself. Hardly any public building has entirely escaped but the Magistrate and Collector's office, and that was saved by the mutiny embankment surrounding it.

7. Meanwhile all that can be done is to alleviate the miseries of the houseless population, and anticipate the evil effects

of noxious exhalations by suitable sanitary precautions. The Commissioners of Allahabad and Benares Divisions have been encouraged to stimulate private charity for the relief of such classes of distress as do not fall within the scope of Government action.

8. The Sai, a stream to the south of the Goomtee, and taking its rise in Oudh, overflowed its banks in a similar manner; and as late as the 5th the old bridge over it on the road from Jounpore to Allahabad was, when the Commissioner passed, far below the level of the water. It is reported also that the bridge over this river near Pertabgurh has been swept away.

9. Other places have suffered in the Jounpore district, and the town of Jafferabad, three miles to the south, is said to be even worse off than Jounpore.

10. The accounts from Azimgurh are not so bad; but there, too, great destruction has taken place. The city probably admitted more easily of the means of protection; and two young Settlement Officers, Messrs. J. R. Reid and Rogers, are especially mentioned as having laboured with extraordinary devotion in throwing up embankment after embankment, and thus materially contributing to the saving of the town.

11. An important question, affecting to some extent the question of the rehabilitation of Jounpore, is the cause of these unprecedented floods. They are attributed to an extraordinary fall of rain during the 13th, 14th, and 15th September, but the Lieutenant-Governor has no information other than general report on this point.

12. It is recorded in some history, which His Honor is not able at this moment to refer to, that when a Brigade of troops under Sir R. Barker was pushed up to Sultanpore on the Goomtee in 1773, preparatory to the Rohilla war, they sailed over the Jounpore bridge on the top of a flood. This story had hardly been believed before, but it is now shown to be

quite within the bounds of possibility, and the fact that a similar flood has occurred again lends force to the belief in the insecurity of the present site of the city.

13. No official reports have yet been received, as it will readily be understood that the officers of both districts have hitherto been able to conduct public business under circumstances of the utmost difficulty. At Jounpore the Commissioner has prudently directed the officers to retire to a distance of two or three miles from the station and its malarious influences. Still the demi-official reports have been sufficiently full and accurate to warrant the representations now made to the Supreme Government.

14. His Honor is happy to be able to report that the English officers, both at Azimgurh and Jounpore, have distinguished themselves by the most laudable exertions, and have spared themselves no labour or exposure in seeking to ameliorate the effects of the calamity.

15. Both Commissioners visited the scenes of the disaster, Mr. Forbes making the journey at considerable risk and in spite of much exposure, while the floods were yet at their height. Mr. Mayne was at the time prostrated by sickness, but he set out for Jounpore as soon as he was able to do so.

16. It is a matter of much satisfaction that, mainly owing to the precautions and labours of the Officers of Government, there has been little or no loss of life, excepting a few casual accidents which could not have been obviated.

3.—*From* F. O. MAYNE, ESQ., *Commissioner of Allahabad Division, to* C. A. ELLIOTT ESQ., *Officiating Secretary to the Government, North-Western Provinces.—Dated Allahabad, the 7th October,* 1871.

HAVING visited Jounpore, the scene of the late heavy floods, in company with Colonel Alexander, Superintending Engineer, I have the honour to report, for the information of

Government the result of our observations and the instructions I considered it necessary to issue.

2. The first sign of the floods presented itself to us at Jelalpore, a village on the River Sai, about 9 miles from Jounpore, on the Benares road. This was on the 2nd of October, the flood having by this time gone down some 3 feet. For about a mile on this side of Jelalpore we drove along the metalled road with water up to the axle-trees of the carriage; culverts were no longer visible. The village of Jelalpore itself, fortunately built on very high ground, has escaped, but a large bazaar, which existed on the low-land towards the river, is now level with the ground on which it stood; not a wall or a stick is left standing. Here all trace of the road ceased, and we proceeded by boat to Bakurabad, about 1½ miles on the other side of the Sai. On the way we passed tall mango topes more than half their height being still under water. The fine old Mahomedan bridge over the Sai, built in the time of Akbur, was deep down in the stream, and its site only marked by the top of the cupola of a lofty Hindoo temple built at one end of the bridge; a foot and half of this cupola only was above water. The line of railway embankment, which had been entirely submerged, was just again visible. The Sai between the 16th and 27th of September had risen 23·7 feet. The waters began to recede very slowly from the 27th. From Bakurabad the road was open all right to Jounpore.

3. On arriving at Jounpore the *only* inhabitable bungalows we found were the Collector's house and the Club; all other houses had been sapped by the water and rendered uninhabitable. A day or two before we arrived there had been a foot and a half of water in Mr. Halkett's portico, and a 1,000 maund Monghir boat was moored outside his compound ready as a last place of refuge. A corner of his house had fallen. In the next compound there was still 3 or 4 feet of water in the Judge's Cutcherry, and some of the pucca out-offices had fallen. But the water had slightly gone down, and we could

walk dry-footed to the opposite boundary of Mr. Halkett's compound, where we got into a boat. The stench from the decayed vegetation, even in the small portion of land thus exposed, was something awful and most sickening. We proceeded in the boat through deep water along the fine old mango avenue leading to the Collector's Cutcherry, carefully looking out for cobras and other reptiles which were only too anxious to take advantage of a passing boat to escape from their sylvan refuge in the trees above. Passing in the distance the public offices of the Collector which had been saved by the mutiny entrenchment, aided by a temporary embankment, and then the half ruined Jail, we skirted the line of road bordered by fine bamboos leading down towards the bridge, floating over buried houses, trees, and other dangers which the local knowledge of our not very skilful pilot did not always enable us to avoid, until we came in sight of the Fort. Here on all sides was a huge vista of water, interrupted occasionally only by the upper story of some lofty pucca house, by the semi-immerged trees, or falling mosques. On one side was pointed out the place where a large suburb known as Mianpore, chiefly occupied by our Omla, had once stood, and was now no longer visible. In another direction the flood was passing rapidly over the dispensary without showing a trace of what was beneath it. We went on past the Fort to the old bridge; just the tops of a few remaining shops built by Mr. Ommaney were alone visible, and the river was rushing past like a mill stream.

4. The whole of the town on the right, or southern bank of the Goomtee, consisting of some 2,000 houses, and known as the British quarter of the town, was submerged, and is utterly destroyed. About half of the town on the other side, or the old city, has been washed down. The masonry shops on the sides of the main streets and the chowk have many of them here withstood the strength of the flood, but behind there is nothing but desolation and woe. The sight from the top of the Fort was one not easily to be forgotten. It was terrible to

behold the vast expanse of water which covered the face of the earth as far as the eye could reach, and to think of the many houses destroyed, the wealth lost, and the distress and sickness to come. The chief part of the town which escaped is on the high ground near the Fort between the Fyzabad and Azimgurh roads; but even here much damage has been caused by the heavy rain where the floods never reached.

5. To give some idea of this awful flood I will quote a few statistics given to me by Mr. Easton, the Resident Engineer of the Oudh and Rohilkhund Railway. The Railway Engineers had heard of a company of European Soldiers sailing over the old Goomtee bridge at Jounpore a hundred years ago, and regarded the story as one of the veritable old woman's tales of a similar nature, and did not believe it. The highest recorded flood was that of 1830. The lineal feet of waterway in the old bridge is 300 feet, its superficial area 5,550 square feet. A railway bridge was proposed with 668 lineal feet of waterway, and 14,920 superficial feet.

The flood of this year was 18·6 feet higher than the highest flood of last year, and 11·6 above the point shown by the Natives as the height of the floods in 1830. The bottom of the girder of the new bridge, had it been built, would have been 6 feet below the level of the highest flood of this year. Further back from the bridge on the north side there is a descending grade or fall from the bridge and there the water was six feet over the top of the bank. In Thornton's Gazetteer the following reference is made to the flood which occurred a hundred years ago.

"In 1774 a fleet of boats conveying a British army, with a numerous train of baggage, camp-followers, and attendant animals, were borne down the stream right across the line of roadway without any impediment from the submerged structure."

6. Without a question, the heavy rain-fall in Oudh at Gonda, Fyzabad, Sultanpore and Pertabgurh on and after the

13th of September was the immediate cause of these floods. Nothing unusual occurred at Jounpore before the 15th. On that day the water began to rise in the Goomtee: on the 16th in the Sai. The water of both rivers continued to rise rapidly till the 27th. Those of the Goomtee in 12 days rose 27 feet. Those of the Sai 23·7. As the Sai rose, its stream became less rapid, thus showing that it was dammed up by the higher and stronger waters of the Goomtee. On the 20th the two rivers were nearer the same level than at any other time, the Goomtee still being one foot higher than the Sai. On the 27th the waters of both rivers began to recede very slowly. On the day we left, the 5th of October, the waters had gone down about 8 feet out of the 27, and navigation was daily becoming more difficult.

7. We considered the question as to the effect of the railway embankment on the floods. It crosses the country at nearly right angles to the rivers, and the openings left for the bridges give ample waterway for the rivers at ordinary high floods. The Railway Engineers scout the idea of the embankment being in any way the cause of the flood, and point to the obstruction of the old Mahomedan bridge and of the city itself. They point to the water having risen far above the embankment and running for days at the same level on both sides of the embankments, to the submersion of Jafferabad, 3 miles south of Jounpore, and on the other side of the embankment, and which could not possibly have been effected by the railway; but notwithstanding all this, after looking at the levels for some miles on both sides, *i. e.*, north and south of the two rivers, one cannot but be impressed with the fact that the railway embankment being raised to one level height over a long range of country, must necessarily check the natural drainage of the country, and stopping up old channels by which the rain water naturally passed away, independently of the rivers, has forced it to find other channels down into the valleys of the two rivers. I do not go so far as to say that the railway embankment caused the high floods, but I maintain that by

causing an accumulation of water in the valleys in the beginning of the flood, the effect was materially to increase the collection of water in the rivers before the big flood came down, and thus to cause afterwards the waters to rise higher than they would otherwise have done. I think it cannot be denied that, although the embankment did not cause the flood, the level of the flood would not have been so high if the embankment had not been there.

8. The next day we visited the ruins of Jafferabad, a town of about 3,000 inhabitants, chiefly well-to-do Mahomedan paper manufacturers, who had built themselves strong pucca houses. A similar scene presented itself as at Jounpore, but, extending over a smaller area, the destruction was more painfully manifest to the eye. The waters were still very high, and we went in a boat all over the village. The loss of property here has been very great, and the fear of sickness the same as at Jounpore.

9. Mr. Halkett, the Officiating Collector, ably assisted by Mr. Gardner, Joint Magistrate, Mr. Man, Deputy Collector, and Mr. McMullin, the Police Officer, had evidently done all that he possibly could do to save life, to provide for the temporary accommodation of the homeless sufferers, to preserve sanitation, and to save public property and records, and he did not hesitate to take upon himself every responsibility the urgency of the occasion required. Of the exertions, foresight, and excellent judgment exhibited by Dr. Cleghorn, the Civil Surgeon, I cannot speak too highly. He did well to remove all the prisoners from the scene of disaster and send them to Benares. He has been, since sickness began, untiring in his attendance upon and providing for the sick; and, as Health Officer of the town, has done much to prevent the spread of malarial fever and epidemics. A few cases of cholera have occurred, and the disease was aggravated by the overcrowded and filthy state of some of the few remaining houses. Dr. Cleghorn was always among them administering to their

wants, exhorting them to disperse, and endeavouring to remove the immediate cause of sickness. His efforts were, I am glad to say, up to the time I was at Jounpore, crowned with some success, and cholera was already on the decline. The services of Officiating Deputy Collector Nusseer-ood-deen have been invaluable, and I sincerely hope that this excellent and trustworthy officer may soon receive his reward in permanent promotion. The City Moonsiff, too, by name Mahomed Saeed Khan, behaved well.* Every officer I have named did his best, and deserves the cordial thanks of Government.

10. I have been asked why the officers did not protect Jounpore with embankments as they did at Azimgurh. My answer is that it was simply impossible, and even had it been done, it would have been useless. On the south side no embankment would have kept the waters out of the town; on the north side protecting embankments would appear to be more feasible; but even here the water topped any embankment that could have been put up with the limited labour at their disposal in so short a space of time, and would only have served to raise misplaced confidence. The flood at Azimgurh could not have been anything like that at Jounpore, and the water at the latter place rose so rapidly that all the people could do was to fly and save their property. And there were none left to work at embankments. With the exception of Ally Naseer and one other, the Municipal Commissioners with the Rajah of Jounpore and other influential citizens were the first to fly. Perhaps it is hard to blame them under the circumstances.

11. No use whatever was made by the people of the high lands of the Fort. The Civil Surgeon afterwards established a Dispensary or Cholera Hospital there, but with difficulty could induce any one to attend. They say the Fort is so full of snakes they do not like to sleep in it.

4.—*From* C. A. ELLIOTT, ESQ.; *Officiating Secretary to Government, North-Western Provinces, to* F. O. MAYNE, ESQ., C.B., *Commissioner of Allahabad.—Dated Nynee Tal, the 18th October*, 1871.

I AM directed to acknowledge the receipt of your letter dated 7th October, giving an account of your visit to Jounpore from the 2nd to the 5th of this month, in company with Colonel Alexander, Superintending Engineer, and of your proceedings there.

2. This is the first official report of the calamity which has been received; but His Honor has been kept constantly informed of the state of things by letters which, under the pressure of the disaster, have hitherto been necessarily informal and demi-official. Your present report is full and comprehensive, and I am to thank you for the graphic description you have given of the condition of the city.

3. I am also to acknowledge the receipt of your telegram dated 13th instant, soliciting "sanction to an advance of Rs. 10,000 for relief at Jounpore." You will have received a telegram sanctioning the advance: and you are requested to submit a report showing the principles under which the money will be expended. The manner in which the sum is to be adjusted in the public accounts will be considered hereafter.

4. Meanwhile it is the pleasing duty of the Lieutenant-Governor again to acknowledge the devoted service rendered to the people of Jounpore by Mr. Halkett, the Magistrate and Collector, and by Mr. Gardner, Joint Magistrate, and also by Mr. Man, Deputy Magistrate, and Mr. McMullin, the Police Officer. The praiseworthy efforts of Dr. Cleghorn, not only in reference to his immediate charge of the Jail, but as Sanitary Officer towards the people at large, have been noticed with much satisfaction. The excellent service of Deputy Collector Nusseer-ood-deen will be intimated to the Board of Revenue as improving his claim to promotion; and also those

of Mahomed Saeed Khan, City Moonsiff, to the notice of the High Court. Ally Nusseer and another (whose name should be given) are mentioned as Members of the Municipal Committee who also aided. The remainder are said to have fled; but as remarked by you, when their houses were devastated by such a flood it would be hard to blame them for providing first for the safety and comfort of their families elsewhere.

5.—*From* J. D. SANDFORD, ESQ., *Officiating Magistrate of Azimgurh, to* W. A. FORBES, *Officiating Commissioner, 5th Division, Benares, No.* 116.—*Dated Azimgurh, the 3rd October,* 1871.

I HAVE the honour to forward a report on the recent calamitous inundation of the City and Station of Azimgurh.

2. The City and Station of Azimgurh are bounded on three sides (to east, south, and west) by the windings of the river Tonse. The average width of the river from bank to bank may be 230 feet, but the banks are for the most part steep, and the river ordinarily runs deep below them.

To the north-east also a small stream, called the Dhurmoo, joins the Tonse—so that the town is situated in a peninsula, the neck of which is to the north and north-west.

3. The land on which the city is built may be described as a narrow strip sloping on the east and west towards the river, the distance across the city from river to river at its narrowest point being about two-thirds of a mile.

4. The station lies to the south of the city, the Jail between the two. The principal public buildings in the station are situated on a ridge of land, the elevation of which is scarcely noticeable, but which secured the buildings from the general ruin, and served as a place of refuge to the residents. The only ornamental feature in the station is the public garden, which is between the Jail and the Collector's office.

5. The area occupied by the buildings of the city is about 350 acres. The population of the city at the last census was 14,543, and the number of houses may be taken at 3,500.

6. It should be mentioned also that all about the city, both in its outskirts and in its heart, are numerous tanks or ponds; and much anxiety was felt lest those in the interior, owing to the heavy rain and the continuous approach of the river, should overflow their banks, and communicate with the main flood.

7. The two exits from the city and station to the south are by the Jounpore and Ghazeepore roads, on both of which were substantial bridges, well above the level of ordinary floods.

8. We had had floods considerably above the average from the 20th to the 24th August, and the river had then risen to the level of the Sidharee bridge on the Ghazeepore road, but no damage had been done. These floods had subsided, and the river was rapidly assuming its ordinary course, when, on the night of Tuesday, the 12th September, exceedingly tempestuous weather, with heavy rain from the east, set in. This continued to the 18th, and in these six days over 11 inches of rain fell. The rain-fall in the Mahool Tehseel, through which the Tonse flows, when first entering the district to the north-west, was, from the 13th to the 19th, thirteen inches.

9. On Saturday, the 16th, the river had risen to full flood, but the main roads were all passable, and the water had not risen over either of the large bridges. On the morning of Sunday, the 17th, however, I was alarmed by hearing that the river had communicated with a large tank, near the entrance of the city, constructed by Mr. Sladen. On my way down to the place I found the water over knee-deep where I had walked dry-foot the night before, and the river rushing like a mill-stream across the main road leading from Jounpore through the station to the city. The means of communication between

the tank and river was stopped up; and the District Engineer was requested to strengthen the road between the tank and the river. And no further mischief was anticipated.

10. But on Monday morning the waters were found rapidly gaining over the road and tank on the city; and in order to provide refuge for the people who were being driven out of their houses, temporary huts were erected in convenient places, and tents were pitched in the green in front of the public offices and in the Mission School compound; and also advantage was taken of the lodgings in a large enclosure at Jowalagunge, which are ordinarily let out on hire to sojourners in the city. The verandah of the Mission School was also made available under Mr. Mallet's orders, and no distress for want of shelter was experienced.

The large Serai near the entrance of the city (built at Mr. Thomason's suggestion) had already become untenable, and the flood had penetrated the main street of the city as far as the Dispensary. The same evening Mr. Rogers visited the outlying Mohulla of Colingunge on the east of the city, and persuaded the people to leave their falling houses.

11. The next morning, Tuesday, Mr. Rogers enabled the inhabitants of Colingunge to move themselves and their property into safety, and that part of the city was submerged. Mr. Rogers also did good service in moving the papers from the Post-office. The same day the embankments were commenced under the superintendence of Mr. Reid and Mr. Rogers.

12. The arrangements which I then made for the protection of the city were as follows:—The Officers of the Settlement Department were not under my orders, but as they had voluntarily come forward and taken the initiative in endeavouring to avert the danger threatening the city, I thought it best to avail myself to the full of their services. I therefore divided the city into two portions, and asked Mr. Reid to take charge of the eastern, Mr. Rogers of the western portion. With Mr. Rogers I associated Mr. Whiteway, Assistant Collector, and with Mr. Reid, Mr. Harkness, Inspector of Police.

I directed the District Engineer, Mr. Sheridan, to look especially to the public buildings and to give his professional advice and assistance wherever it was most urgently required. I instructed all the Tehseel, the Police, and Municipal authorities to consider themselves under the orders of Mr. Reid and Mr. Rogers, and I set aside certain officials specially to assist them; and I urged upon the leading people in the city to give all assistance.

Two of the Municipal Commissioners, Ramgut Singh and Bullum Doss, proved especially useful in their respective quarters. The Civil Surgeon was devoting his whole time and energies to the protection of the Jail and the Dispensary. But it was found necessary to remove the patients from the latter and place them in the Police Hospital, a little building which stands on the top of the ridge before mentioned. The District Superintendent of Police, Mr. Alone, who returned from the interior on Wednesday, was ready with cheerful and valuable help wherever required, and went the round of the embankments at night.

13. In the meantime every road leading from the city to the station had become impassable for foot passengers, and I found it necessary to close the Cutcherry—not only could none of the parties to suits make their appearance, but the officials and Mookhtars were engaged in endeavouring to save their property and at the embankments. All urgent business I transacted at the Kotwallee.

14. All Wednesday, Thursday, Friday, Saturday, the floods continued to rise, and as they rose, so rose also the embankments. In erecting the embankments and continually guarding them against the ever rising flood, and the tempestuous rain, unflagging exertion was required and freely given. The people, as a rule, seconded the efforts of their leaders capitally, and the embankments assumed at the last a height of from two to eight feet and the strength of formidable fortifications.

15. On Monday and Tuesday the rain and storms began again, and were most disheartening. And as the ordinary drainage of the city had been stopped, the rain water could not escape, and we were threatened with floods from within. It was found necessary during these days to remove higher up the street the grain stored in Jowalagunge, which at its lower end received the rain water of a large portion of the town; and also to remove the records of the Opium Department from a building on the north end of the town, which was surrounded by the flood. On Wednesday, the 27th, the river began to recede steadily and weather cleared: and we received additional encouragement and assistance from your presence and counsels.

16. All this time Dr. Wood had had terrible work at the Jail. He had erected a strong barricade in front of the Jail, and this stood to the end. But the river had found a passage by the side of the old embankments erected round the Jail during the mutiny, through which a strong stream ran and communicated with the returning arm of the river on the eastern side of the station. By the force of this stream part of the outer wall of the Jail, which was here made of earth, fell to the ground: and the utmost skill and perseverance was required to prevent the water from invading the inner enclosure and the prisoners' barracks. On Thursday I deputed Mr. Sheridan specially to assist at the Jail, and here as elsewhere he gave most valuable advice and assistance. It was found necessary, in order to divert the stream, to break down the wall of the public garden—and the garden upon which much trouble and money had lately been spent was unavoidably swamped. The Civil Surgeon (assisted ably by the Jailor) acted with admirable energy and perseverance throughout; and his spirit of enthusiasm was even communicated to the prisoners who worked under him with a will, and declared that their Jail should stand, though the city should come to ruin. There was no sign of insubordination or attempt at escape.

17. The floods had in the meantime covered the station with the exception of the high ground above mentioned. Three of the bungalows were in ruins; two others had to be deserted: and the residents of these found accommodation in the offices of the Judge and Subordinate Judge. The other houses in the station were protected by embankments; and of these the out-houses mostly were in ruin. The general wretchedness, as the flood surely and steadily came on, may be imagined. At night one lay awake listening to the crash of falling houses, the roar of the wind and of the tempest, the cries of people in distress, and expecting at all times the report of an embankment burst and of the spread of disaster in the Jail or the city. Notwithstanding all this, the pluck and energy displayed by the Government officials from the Judge downward was almost universal; and their efforts were cheerfully supported by the people. No complaints of theft or other crime came to my knowledge, although Mr. Whiteway was holding a Court in the Kotwallee for the decision of such cases should they arise.

18. On your arrival you directed attention to matters which had not indeed been neglected, but which were under your advice put on a more satisfactory footing. The District Superintendent of Police was directed to organize a more regular boat service for passengers and property from the main embankment at the south entrance of the city to the other sides of the big bridge on the Jounpore road, and of the Sidharee bridge on the Ghazeepore road, distances of about 2 miles. Mr. Alone was also put in charge of conservancy arrangements, and was requested, by means of the corps of sweepers which had been collected, to thoroughly clear the spots that had become most filthy. Not only were the receding waters leaving behind all kind of refuse, but the few open places in the city had been used as places of resort for necessary purposes. Temporary screens have now been erected on selected spots for latrines.

19. The Civil Surgeon has opened branch dispensaries in the city, where medicines will be readily supplied,—one at the

Kotwallee and one at a house supplied by Bullum Doss, Mahajun. Patients will be treated at the Police Hospital until the Dispensary, which still stands apparently uninjured, but a foot deep in water, can be re-inhabited. Proper orders have been given to remove all obstacles to the receding floods, and to purify the drains. Mr. Sheridan has also been directed to go round the city and superintend the removal of buildings in a dangerous state. In order to settle disputes which are sure to arise concerning wood and other materials of the fallen houses, I have, at your suggestion, requested some of the principal inhabitants to form a kind of Committee of arbitration with the Tehseeldar at their head, so that such disputes may be settled on the spot and by the people themselves.

20. On Wednesday, the 27th, I re-opened the Cutcherry, and business from that date proceeded as usual. In the afternoon of Saturday 30th, a meeting of the European and Native residents of the station and city was held, at which you presided and thanked those whose zeal had been most conspicuous. A subscription was also started to relieve the distressed, and to assist the very poor in rebuilding their houses. Up to the present time I have not heard of any distress for want of food.

21. Several of the villages near the city were submerged in the flood, and many urgent calls we had for boats which we had some difficulty to meet. The lives of all the inhabitants were saved. Some 40 boats were procured from the neighbouring Tehseel of Sugree.

22. It is very satisfactory to report that no loss of life took place in the city which can be directly attributed to the inundation.

23. A list of the houses destroyed has been prepared, and shews that 651 (perhaps a sixth part of the city) have fallen either from the inundation or the rain. Of these 502 fell before the embankments were commenced; while only 122 were injured by inundation after the embankments were raised: and

of these only 42 were totally destroyed. As the river rose steadily for five days after the commencement of the defences, these figures will indicate how much is due to the forethought and activity of those under whose directions the embankments were planned and constructed. The loss of property from the fall of houses, including the large Serai, has been roughly estimated at Rs. 42,500. As a rule movable property has been saved; but a large loss was sustained, estimated at about Rs. 1,200, by sugar manufacturers at the north of the town. And a loss of grain was sustained by the zemindars of Raidheepore, an outlying hamlet of the city, estimated at Rs. 300.

24. The only Government buildings that fell down are the Moonsiff's Court-house and portions of the Jail. The Dâk Bungalow is still standing deep in water, although its out-offices have been destroyed. The Dispensary itself appears uninjured; the out-buildings have been entirely swept down. The upper part of the Post-office building is in ruins. The greatest loss to the town in respect of public buildings which it can ill spare is the fall of the Futteh Khan Serai. This was built at the suggestion of Mr. Thomason, when Lieutenant-Governor, by public subscription, in memory of a good Tehseeldar. It stood at the entrance of the town, and was inundated before the embankments were raised.

25. The roads, which have all been under water, of course have suffered immensely. The Imperial road from Jounpore between the big bridge and the main part of the station formed, for some time, an obstacle to the flood, till the angry torrent cut through it. The water rose nearly six feet over the Sidharee bridge, which has been partly carried away. A good flood-mark is afforded by the big bridge, for at the greatest height of the flood the water just passed through the openings at the top of the parapet.

26. I am sorry that no accurate record was taken of the rate of rapidity at which the river rose. As far as I took any note, the most rapid rise was at the rate of a foot in the 12

hours; but after the first day or two the rise was only at the rate of half an inch in the hour. The total rise in the river from the 15th to the 24th is stated by Mr. Sheridan at between five and six feet, but this it must be remembered was upon the top of a high flood.

27. The expenditure from public funds incurred in the construction of the bunds is Rs. 1,060. In most places the people protected paid, but some small sums were expended in the commencement of operations; and the large bunds to the west of the city could not have been kept up without expenditure of public money. The amount is trifling compared with the public benefit resulting from the expenditure.

28. In estimating this benefit, account should not only be taken of the direct protection to the city afforded by the embankments, but also of the fact that their construction afforded occupation and labour to crowds of people who would otherwise probably have been without means of obtaining livelihood. The absence of distress and of crime in the city during the 10 days of inundation may, in a great measure, be attributed to the fact that there was constant work for all.

29. I hope that a searching inquiry may be made as to whether any cause can be assigned for the flood beyond the heavy rains in Oudh. Last year the floods were higher than they had been since 1839 in Mr. Tucker's time, and the present flood appears to have exceeded any of which memory or tradition tells.

30. In conclusion, I beg to refer to the enclosures* in which are given the names of those among the native community, whether official or non-official, who have been conspicuous in working for the common welfare during the past fortnight, and who have been honorably mentioned by Mr. Reid and Mr. Rogers, under whose immediate superintendence they worked. I wish to mention, on my own part, that I consider myself

* Not printed.

fortunate in having been associated with such officials as the European Officers at this station have proved themselves to be by their readiness to meet this great emergency, and to devote with entire disregard of self, their best energies to the protection and rescue of others.

6.—*From* A. WOOD, ESQ., M.D., *Assistant Surgeon, Superintendent of Jail, to* S. CLARK, ESQ., *Inspector-General of Prisons, North-Western Provinces.—Dated Azimgurh, the 30th September*, 1871.

I HAVE the honour to make the following detailed report on the recent excessive rain-fall and extraordinary floods at Azimgurh in so far as they affected the Jail and Jail property at that station.

2. In order that the whole may be as intelligible as possible the report is written in somewhat of a diary form, so that the sequence of events and the steps taken to counteract their evil results may be more clearly brought out.

3. On visiting the Jail on the morning of the 13th, the yards around the several barracks were, as usual after a heavy rain-fall, soft, slimy, and wet, with not a little of surface water remaining in pools all about. This was tried to be got rid of by constructing temporary drainlets, and by sweeping the stagnant water into the main pucca drains. So far nothing was out of the ordinary experience.

4. From the 13th up to the night of the 15th inclusive the rain continued almost incessantly and with exceeding violence, so that from this cause alone part of the wall—a comparatively recently built but kutcha wall—around the Hospital compound was so sapped and softened that it fell literally to the ground. This portion, extended for over 50 yards. At this time the rain began to abate and no further damage was expected. The overturned wall was at once rebuilt to the height of 4 feet, though in a somewhat slight and flimsy

way, simply to prevent any passer by or stray animal entering the compound and doing further mischief. The Hospital, thus brought into full view and easy hail of the many coming and going natives, was abandoned, in so far that all the sick were transferred to a square barrack within the enclosure of the Jail proper. To make assurance still more sure an additional police guard was sought and at once supplied.

5. Up to the 17th nothing of particular moment occurred. The rain fell in showers more or less persistent, but occasioned no alarm until that morning, Sunday. The river was then observed to have risen considerably, being even at that early date almost on a level with its highest natural embankments. At once 150 prisoners were turned out to prepare for any possible increase, and a large bund, extending first at right angles to the public road around the back of the police lines, then parallel with the road behind the Native Doctor's house, godowns, &c., and finally once again at right angles, to the road by the back of the Warder's lines, was erected, thus enclosing the whole of the land forming more immediately the Jail compound. Between these ramparts lay the ground at one time selected for the site of Jail extensions. It should be stated here that some affirm the flood really began on the 16th, but if so, it was in no marked degree, and at any rate I believe I am correct in stating this first Jail bund was the very first to be begun either in the Native city or Civil lines.

6. On the 18th, Monday, a small bund was thrown up right across the public road in the European direction, simply as an extension of the other, as the water, kept back by it, found its way inside by outflanking it as it were. The large bund itself was strengthened and heightened. Day and night unremittingly was it attended to, for the rain again increased and the waters rose with a rapid greediness that gave one some faint idea of what might be. Earth was also thrown up close around all the out-houses and firmly beat into the angle formed by the walls of the houses and the ground, and well that this was done.

7. On the forenoon of the 19th, Tuesday, in spite of all exertions, it was found impossible to keep the large bund intact throughout its whole length, and a second bund, this time much further in rear, *viz.*, on the Jail margin of the public road, was commenced, the leaks in the first being at the same time stopped until this second large bund had acquired more height and solidity. That same day, however, the first bund fell, and the river with two or three impatient onsets beat at the base of the second bund, and encircled all the outstanding houses and godowns. Everything of value had been removed from them.

8. On the 20th, Wednesday, the flood still rose, and in the afternoon the Police barracks, Native Doctor's house, and godowns all gave away. Untiringly the prisoners wrought at the bund, seemingly now the only stay, though even then we felt and said "this must be the worst," and we had lost what we had lost, having done all to save. Still later on, however, a breach was found to have been made, not in the bund luckily, (though it was fearfully assailed not only by the advancing flood, but also by the continual 'wash' from the stream of by-passers either in boat or on foot) but in the rear wall of the Jail garden. Now, too, as well as our front and rear, we had to defend our flank, for the water began to approach from the city side at the same time. To the rear was made a bund from the fallen garden wall, which stayed the onflow for that day at least, and on flank a large strong bund was thrown up across the public road to the city side of the Jail. Thus we wrought on a square.

9. *Thursday*, 21*st*.—Still the floods rose, and all the bunds were strengthened, but the water, baffled thus, began the far more subtle and direr work of undermining. At two points, one by the dead-house, the river worked its way right through its own bank, and appeared inside our entrenchments; the other by what must have been some old concealed drain running underneath the Jail walls into the Jail itself. By it the water entered and bubbled up from under a perfectly dry surface of over 20 yards between its subterranean entrance and exit.

The first was cut down to and stopped by bags filled with earth. The other was also stopped in the same way, but could not be wholly overcome, for again and again the water broke out, and was a continual source of annoyance. Several stakes of over six feet in length *entirely* disappeared in this tunnel.

Again, warned by the fall of the garden wall on the previous day, we threw up earth against all the walls in rear of the Jail, and made it almost pucka by the continuous and nervous blows of the kaidees, moongrees, even though it was deemed almost a work of supererogation, for the large eight feet thick 'mutiny embankment' opposed its friendly bulk and strength between the water behind and the Jail itself. Still it could only be an error on the safe side, and labour was not lacking, for on that day over 200 prisoners were employed, and continued to be almost up to the end.

10. On the 22nd, Friday, the cross bund towards the city gave way, the other one in the opposite direction having yielded before soon after the first bund of all had been given up, but the second large bund was interior to it, so no harm resulted. Nothing in front fell this day, but from the rear came the worst blow of all. The water having risen sapped and overturned all the garden walls, and then flooded to overflowing a large nullah close by the foot of the mutiny rampart. In fact this nullah was, I believe, originally the entrenchment made outside the said rampart, but from the very beginning the water had rushed past by it with a terrible volume and velocity. The rampart fell. We had trusted to it, and save for the earth beat against the walls before spoken of, we were at the mercy of the flood. Work outside the wall was impossible, for the water was already eating—devouring—what we had opposed to it, and we knew the walls themselves, the kutcha walls, would go down, and that right soon they did when swept naked of the basement we had given them. This kutcha wall formed the back of the Hospital compound, and was continuous with the back pucca wall of the Jail proper. The side wall, or wall running between the Hospital and Jail enclosures was also kutcha

the only weak place in the walls of the Jail proper. Luckily—very luckily—quite within the outer Jail walls stood the old barrack pucca walls, and though enclosing only some 6 barracks, little more than half the whole accommodation for the prisoners, it was resolved that *they* should constitute the Jail, and that *they* should *not* fall. Quickly, but surely and strongly, as I now believe only prisoners, willing heart and soul, and backed by officials who had thrown *mere* duty aside and had substituted self-interest in its place, could do, was a firm basework of earth thrown up around all these inner pucca walls. It was made hard as iron. Now, when the rain has fallen, when the flood has risen, and beat upon it, it remains hard as the walls it supports. Over all, moreover, was turf beat in, and then we rested for that day.

11. Next day, the 23rd, Saturday, the bank of the river, which before had been undermined, gave way. The dead-house was quickly surrounded and fell in the afternoon; but as it fell the louder crash of the weak unreliable kutcha wall behind withdrew all attention from its downfall; for now there was but the before-mentioned inner kutcha wall running between Jail and Hospital to keep up the intactness of the Jail itself. It, too, was now exposed to the full force of the flood behind. It could not long stand. Again an increased guard was sought and supplied to take its place when it should fall. And it did so that night, and the Jail was flooded. It was hard, for just then the waters seemed sated, and flood ceased to rise. It was all too late; we had not been able wholly to hold our own.

12. On the 24th, Sunday, the flood began to go down, but our wall had fallen, and it seemed but a small thing almost when next the warder's lines went down too. Still the men worked, and worked well, for we were afraid to rest even then. And the tale of our losses was not yet full, for—

13. On 25th, Monday, the small house inside the Jail for parching gram was sapped and fell, for, like the walls, it was of

kutcha work. And still the flood went down. But in the evening, remorseful at leaving aught standing, the rain returned and the flood again began to increase, and on the—

14. 26th was even as it had before been. Then we were thankful we had never slackened, for we thought that, in spite of all, the rain, and the wind, and the flood, the bund was our own, and that we could hold the inner Jail against the whole. And surely it was their meed, for through cold and wet not a convict even but wrought his best. For all that the cook-house and pottery factory fell. They too were kutcha. A corner also of the barrack, which had been made the second hospital, but from which the sick had again been removed, gave way. The barrack itself seemed likely to share the same fate, as also did two other barracks, one and all kutcha of course. These have not fallen, but are totally unsafe and must be condemned.

15. On the 27th, or even night of the 26th, the flood for a second time seemed spent, and from that time speedily decreased, very slowly at first, but now more rapidly.

16. *29th to 30th.*—The Jail is even yet not quite free of water, for the outer drains cannot be opened, as the Jail, standing rather lower than the surrounding water, would again be flooded to-morrow; however, most likely this can be done. By continuous baling, however, the water has been lessened greatly day by day, and to accomplish this, on account of the Jail standing somewhat higher than the outside *ground* (though lower than the *water*), several bunds had to be erected and the water chased from behind the one to behind the other, much like the stream in a canal by locks, until finally it was thrown outside altogether.

17. I cannot conclude this report without in a very special way bringing to notice the good service rendered by each and all of the Jail officials. Whether it was their special work or not, Baboos and Mohurrirs alike, and even the Native Doctor, worked and superintended the work, as though they acknowledged no

other end in life. No words can be too strong to express the patience and quiet assiduity with which the Darogah overlooked and directed all. Day and night he examined every structure we had raised, strengthening where needed or adding where required. Under him the prisoners without exception worked as men seldom work, willingly and well, seeing only that their best efforts went only more thoroughly to secure their own confinement. Throughout the whole trial no word, no thought of escape, was present among them; nay, some even encouraged the others, and maintained 'that though the whole city went down, the Jail should stand if they could help it.' They deserve the highest praise.

7.—*From* C. A. ELLIOTT, ESQ., *Officiating Secretary to Government, North-Western Provinces, to* W. A. FORBES, ESQ., *Commissioner of Benares.—Dated Nynee Tal, the 28th October*, 1871.

I AM directed to acknowledge receipt of your letter dated the 9th instant, with which you submit a report by the Magistrate of Azimgurh on the floods in his district.

2. In reply, I am to say that the Lieutenant-Governor has read this excellent report and the very full and complete account of the prolonged and destructive flood, and of the measures taken to arrest its dangerous progress, with the utmost interest and gratification.

3. It is true that the disaster is not to be compared in severity or extent to that which has befallen Jounpore, where two-thirds of the city have been destroyed by the Goomtee. The injury done by the Tonse has extended only to about one-sixth part of the town of Azimgurh. But it is very certain that the damage would have been immensely greater but for the incessant labour of the officers and people on the embankments by which the inroads of the devastating flood were stayed.

4. I am to request that the thanks of the Lieutenant-Governor may be communicated to Mr. Sandford for his excel-

lent report of the circumstances attending the disaster, and for the arrangements for the employment of the various officers at his disposal, which appear to have been in every way admirable.

5. The conduct of Messrs. Reid and Rogers cannot be too highly applauded. They spontaneously led the way in the erection of the embankments and placed their services at the disposal of the Magistrate; and it appears to have been mainly to their endeavours that the safety of a considerable portion of the city was due. The Lieutenant-Governor has already communicated to these officers direct his sense of the obligations under which they have laid the Government by their devotion and zeal. Mr. Whiteway, also, the Assistant Magistrate, worked effectively under Mr. Rogers.

6. The Lieutenant-Governor has noticed with much approval the extraordinary labours and exertions of Dr. Wood, in preserving the central buildings of the Jail, as well as the singular spirit and assiduity with which the prisoners applied themselves unremittingly during the whole period to secure the safety of their prison. The Darogah is mentioned with special commendation, and likewise the Native Doctor and the other Subordinate Jail officials.

7. Messrs. Alone, District Superintendent, and Sheridan, District Engineer, also gave zealous and valuable assistance in directing and supervising the erection of embankments.

8. The native officials of the place did excellent service and heartily supported their inferiors. The Lieutenant-Governor's commendation may be communicated to Ali Hussun, Settlement Deputy Collector; Abdool Khaleel, Tehseeldar; Mohun Lall, Deputy Collector; Mahomed Hussun, Superintendent of Octroi; Abdool Rahman Khan, Settlement Nazir; Ghazee-ood-deen, Judge's Nazir; Mahomed Ikram, Government Pleader; and Bijai Singh, Canoongoe. His Honor is also pleased to see that Kadri Shah, a brother of Rajah Salamut Shah of Azim-

gurh, lately appointed Naib Tehseeldar, justified the selection by his conduct on this trying emergency.

9. The native gentlemen named in the margin contributed effective aid to the Government officials, and the Lieutenant-Governor tenders his thanks to them for the labour they underwent in protecting the town from destruction. Indeed, the general bearing of the inhabitants is most favorably reported of, and has afforded the Lieutenant-Governor much satisfaction.

Ramjeet Singh, Dookhee Singh, and Bullun Dass, Members of Municipal Committee; Shere Mahomed Khan, Jugbundun Misr, Bisheshur Lall, Fukeer Dalal, Chujjoo Dulal, Ali Buksh, Ameer Hossein, Shunkur Singh, Khwaja Himayet-ool-lah Khan, Sheikh Gholam Ali, Ali Hossein, Baluk Chowdree.

10. To yourself, also, the Lieutenant-Governor offers his best acknowledgments. You travelled regardless of great exposure, and at some risk, to Azimgurh, at a time when it was with difficulty to be approached, and by your directions and advice materially contributed to re-assure the people, and place the proceedings for sanitary and other measures of relief on an effective footing.

11. Orders will be issued on the recommendation to allow some remission of their sentences to the prisoners for their excellent conduct after communication with the Inspector-General of Prisons.

Art. VII.

BOOKS SUBMITTED BY NATIVE WRITERS.

1.—*Memorandum No.* 143 *by* DIRECTOR OF PUBLIC INSTRUCTION *on an Urdu Manuscript of* 178 *pages, entitled* ZUBDAT-UL-HIKMAT, *by* MUHAMMAD ABDUL HAQQ, *of Khairabad.*

THIS is an abridgment in Urdu of books used in Mahomedan education, and the subjects treated are three, *viz.*, (1) *Mantiq*; (2) *Tabí'í*; (3) *Iláhi*, or Logic, Physics, and Metaphysics. *Mantiq* is the foundation of Mahomedan learning, and succeeds grammar in the beginner's course, and the two together form the mental discipline which is considered necessary for undertaking the philosophical studies named above, *viz.*, *Tabí'í* and *Iláhi*. Of these, few students attempt anything beyond a verbal knowledge of the technicalities and definitions. They are in fact gymnasia for the exercise of the logical faculty. The consequence is that Mahomedan education makes its graduates adepts in dialectics without giving them any real knowledge except what is contained in speculative philosophy and interpretations of the working of the hidden agencies and principles of nature. The reasoning is exact; but the premises being visionary, the results are unpractical. Experimental observation and induction are wanting, and the rejection of error in the search after truth is hampered by the veneration paid to the philosophy of their forerunners by every succeeding generation of schoolmen, hence the immovableness and stagnation of their scholasticism. *Mantiq* leads to *Tabí'í* and *Iláhi*, but these lead to nothing, and were it not that some practical minds have turned their attention to Mathematics, and to Ethics, there would be absolutely no real knowledge among the Moslems; and the intellectual subtlety which their system of education induces is wasted power, so far as the interests of science and humanity are concerned.

Wherever the Mahomedan has scope for the exercise of his reasoning powers, whether in grammatical analysis, argu-

mentation, intrigue, or law, his ability is conspicuous, and could we only induce our Moslem friends to extend their enquiries to the wide fields of fact and experimental science which Europe and America have opened up, they would soon make rapid strides. The Arabs once borrowed largely from the west, so completely spheterizing their acquisitions, that they have become all but a sacred heirloom of the past. Would that their successors in India would look westward a second time. It should be our effort to encourage them to do this, and I am inclined to think that one way at least is to popularize their books of science without necessarily countenancing their currency as really valuable.

The value of the work before me lies in this. It is a step towards the popularization of a species of learning hitherto concealed from the vulgar gaze. It will have the effect of bringing it within the compass of a greater number of readers, and exposing it to practical criticism of men who know something else. I have gone over it with two competent Mahomedan scholars, and am of opinion that the author has done his work well, and may be depended upon as a reliable expositor. The work is valuable in another way. It is a storehouse of technicalities, by the aid of which a Native English scholar could do much towards translating English philosophical works in a way intelligible to Mahomedan *savants*. A door of hope is thus opened for the gradual reformation of Mahomedan scholasticism, and the introduction of more practical philosophy, as was the case in Europe when Bacon had gained the attention of his contemporaries. These few remarks, which I submit to His Honor's maturer judgment and experience, explain my sense of the author's merits. He deserves thanks for his performance; and as the book comes up under the prize notification, perhaps a prize of Rs. 200 may not be considered inappropriate. If the writer publishes his MS., copies might be taken for distribution in our Colleges, and among the Societies which exist for self improvement or literary disputation.

2.—*From* C. A. ELLIOTT, ESQ., *Officiating Secretary to Government, North-Western Provinces, to* M. KEMPSON, ESQ., *Director of Public Instruction* (*No.* 4*B.*).—*Dated Camp, Teekumgurh, the* 11*th January*, 1872.

IN reply to your docket No. 2351, dated 28th December last, I am directed to state that His Honor the Lieutenant-Governor concurs generally in the views expressed in your Memo. on the Urdu work entitled "Zubdat-ul-hikmat:" by Muhammad Abdul Haqq, of Khairabad.

2. Although the popular course of Mahomedan reading in the indigenous schools is barren of any fructifying results, yet no doubt a certain acquaintance with the Logic and Metaphysics of the Arabs is useful both to those who desire to become familiar with their modes of thought and reasoning, and also to those who study to acquire the power of communicating new learning to the Mahomedan classes in language and by lines of argument appreciated by them.

3. In this point of view, His Honor thinks that the present small treatise by popularizing the study will prove useful, and is deserving of reward. The Lieutenant-Governor sanctions, as recommended by you, the grant of an honorarium of Rs. 200 to the author.

4. This letter, together with your review, will be printed in the Selections from the Records of Government, as suggestive of the most hopeful course to be pursued both by the Moslems themselves, and by those who would seek to enlighten them.

Art VIII.

DRAINAGE AND IMPROVEMENT OF THE SAHARUNPORE AND MOOZUFFERNUGGUR DISTRICTS, N.-W. P.

RESOLUTION No. 888J.

1.—PUBLIC WORKS DEPARTMENT (IRRIGATION BRANCH).

Dated Allahabad, 26th April, 1872.

READ—

I.—Report on the condition of the West Kalee Nuddee, by Lieutenant Marshall, R.E.

II.—Memorandum on the above, by the Superintending Engineer, 1st Circle.

OBSERVATIONS.—This report shows that it would be difficult to find a channel with better conditions for passing off the drainage of the country than that of the West Kalee Nuddee below Moozuffernuggur. In the valley of the river along this portion there are five swamps; these are said to have increased in size since canal-irrigation commenced in the neighbourhood, but as they are situated on the right bank of the river, while the canal-irrigation is all on the left bank, the connection between the two is very uncertain. It will, however, be a profitable undertaking to drain these swamps; and it will be proposed to the General Department, which may be able to arrange for funds; in which case provision should also be required for the realization of the expected increase of revenue by a rating, as a return for the expenditure which would be Provincial.

2. His Honor concurs with the Chief Engineer and with Captain Moncrieff that there is no need at the present time for a new bridge over the Kalee Nuddee on the road from Moozuffernuggur to Shamlee; and that part of the project may stand over.

3. Above Moozuffernuggur the only tributary requiring improvement is the Seela Nuddee. Design and estimate for the work accompany this report. This should be undertaken at once.

4. The Rehee swamp mentioned by the Superintending Engineer is now being drained.

5. It is shown in the report that the Ganges Canal cuts off about 70 square miles of the catchment basin of the East Kalee or Nagun Nuddee from its natural outlet, and that the drainage of this area must be carried off to the West Kalee Nuddee in order to prevent the recurrence of serious flooding, which now happens after any unusually heavy fall of rain. Many complaints have lately been made by the Civil Officers regarding the condition of this tract, and the relieving of it is evidently an important object. The Superintending Engineer, 1st Circle, should be instructed to hasten the submission of a carefully prepared project for this object.

6. The project for clearing the heads of the East Kalee (Nagun) Nuddee is an important one. Its immediate submission is desirable.

7. On the general question of the recent outburst of fever in the Saharunpore and Moozuffernuggur Districts, His Honor sees no ground to doubt that the attack was exceptional, and probably in its origin distinct from the normal malarious fever prevailing in these parts. This has, indeed, been admitted by the Sanitary Commissioner; but Dr. Planck has at the same time observed that this special fever, while it ultimately cleared off from the better-drained parts, left permanent evil effects—debility, spleen, and prostration—in the people inhabiting the moister tracts.

8. The Lieutenant-Governor requests that the thanks of Government be given to Lieutenant Marshall, for the labour and zeal with which he has discharged the duty committed

to him, and for his excellent report, the leading parts of which will be printed, as bearing on the general question of the drainage of the Upper Doab.

2.—*From* OFFG. SUPDG. ENGINEER, 1ST CIRCLE, *Irrgn. Works, N.-W. Provinces, to* JOINT SECRETARY TO GOVT., N.-W P., *P. W. Dept, Irrign. Branch,* (*No* 2688).—*Dated Meerut, the* 25*th August,* 1871.

I HAVE the honour to submit Lieutenant Marshall's report of the survey conducted by him during last cold season into the condition of part of the Saharunpore and Moozuffernuggur districts, and especially of its drainage outlets.

2. The first sixteen paragraphs of his report are devoted to a general description of the country between the Hindun and West Kalee rivers, often called "Deobund Doab." He shows that it is of a dry climate; that the general spring-level is from 18 to 25 feet below soil; that the villages are abundantly supplied with wells, upon which they depend for drinking-water as well as irrigation, but that few of them pierce the clay substratum below which alone is to be found a certain perennial supply; that the surface-drainage is much impeded in its outflow by being held up in the fields it passes over, but yet that there are few swamps of any size; and that in certain places the spring-level has actually receded. He further states (para. 13) that the cultivation of rice is largely practised in the hollows of Saharunpore, hardly at all in those of Moozuffernuggur; and that the people do not attribute to it any particular unhealthiness. Finally, in summing up this description, in para. 16 he argues, I think with evident truth, that, except as regards its khadir land, the Deobund Doab is no place for artificial drainage, which would probably do more harm than good.

3. Lieutenant Marshall then passes over to the country to the east or left of the West Kalee Nuddee, and shows that here, where canal-irrigation is extensively practised, a very different

state of affairs is the result. Here the water-surface has risen greatly in the wells, and springs crop out in the low lands. He says, para. 22, that there are three principal drainage-lines in this tract running into the West Kalee Nuddee, and that all require clearance. Projects for all three have been drawn up, *viz.*:—(1) The Seela Nuddee improvement, returned to me on the 18th May for more information; (2) the Rehee drainage project, sanctioned by G. O. 1366I., dated 2nd May, 1871; and (3) Lieutenant Western's project for draining east and south of Moozuffernuggur, submitted with my No. 2524 of the 9th instant.

4. Lieutenant Marshall suggests that, should the Doobund Branch be carried out, the clearance of the similar hollows in that Doab should be carried on simultaneously with the progress of irrigation works, and this seems worthy of consideration. He says the people of that district are clamouring for irrigation, and he gives a list of villages in the Moozuffernuggur Zillah where *kutcha* wells already exist or can be dug, and where, therefore, canal-water should not be taken. He does not take into account, however, that many of these might be ruined by the approach of irrigation.

5. Lieutenant Marshall finally concludes this portion of his report (paras. 20 to 24) by dwelling on the sanitary condition of the district and the fever of 1869-70. He alludes to similar visitations in 1817 and 1843, and states his impression that the two last years have been so exceptional that it would not be prudent to enter on any great enterprise on the supposition that they are normal. He notices the coarser food that the drought of 1868-69 forced the poorer classes to live on, the extensive denudation of trees caused by the railway, and lastly, the terrible hopeless filth of the villages.

6. While on this subject, it may not be out of place to allude to the evidence given by Dr. Cuningham in his Sanitary Report on India for 1869, showing that the sweeping charges brought by Dr. Planck against irrigation as the source of so

much of this fever are at least non-proven. It is only what I myself believed all along, after residing in these fever-stricken zillahs throughout 1869 and 1870; but of course I felt I might be partial, and it was disheartening to hear at the Meerut Conference of November last, officers of such experience as Mr. Court and professional knowledge as Dr. Planck, pronouncing so positively on the subject, and to think all one's work might be really for evil more than for good. So Dr. Cuningham's testimony is all the more gratifying. Moozuffernuggur, with its rice-swamps and over-irrigation, has not suffered so severely as Rawul Pindee, which is unirrigated, "stands on high ground, and has excellent drainage." The deaths from fever per 1,000 were—

In Saharunpore,	...	...	12·91
Moozuffernuggur,	...	...	15·45
Rawul Pindee,	...	...	23·63

So far Dr. Planck's theory seems disproved. But he is perfectly right in saying that the improvement in the town of Moozuffernuggur has been simultaneous with the reduction of its irrigation. Statistics show that areas irrigated within its town-lands for the four years 1867-68 to 1870-71 have been respectively 437, 697, 211, and 66 acres; while the areas irrigated during the same years within a radius of about 2 miles of the town were 3,003, 4,539, 2,898, and 2,269 acres. About 40 per cent. of this irrigation was usually in the khurreef, and the greatest khurreef area was in 1869—the year of greatest sickness. After that the irrigation was reduced.

7. At the end of his report Lieutenant Marshall gives certain statistics of 76 villages, from which it is impossible to form any law as to where fever might be expected and where not.

8. Lieutenant Marshall then proceeds to a close description of the West Kalee Nuddee, Part III., paras. 1 to 31. He shows that its catchment basin is about 700 miles, and that this has been affected to some extent by the alignment of the canal

and rajbuhas. He gives the cold-weather discharge at from 90 to 120 cubic feet per second, and the flood discharge from 5,000 to 6,000 cubic feet; and he shows (paras. 6 and 11) that from the town of Moozuffernuggur downwards it would be difficult to find a better-conditioned river. He then investigates the effects produced on the river by irrigation. He shows that the amount of water actually discharged from the tails of distributaries and escapes is very trifling. On somewhat vague grounds he assumes (para. 14) that about 50 of the 120 cubic feet cold-weather discharge are due to percolation, and he combats the notion that the saturation of the soil has increased the violence of the floods, showing cause (para. 15) why the result should be the reverse.

9. Lieutenant Marshall proceeds to consider how far the Kalee Nuddee would be fitted for its functions were irrigation fully developed on both its banks. He assumes from other calculations that about one-eighth or one-ninth of what falls on the catchment basin now finds its way to the river, and that one-third of the rain-fall would be about what it would have to carry off after a complete system of drainage. He thence deduces that the West Kalee Nuddee may some day have to carry off floods of from 12,000 to 16,000 cubic feet per second.

10. With this I think we need not trouble ourselves at present. Colonel Brownlow's experience led him to consider that 9 cubic feet per square mile of catchment basin was as much as it was necessary to provide for in making drainage cuts in these provinces, and I have had a satisfactory evidence of the accuracy of this within the last few days. In para. 3, Part II. of his report, Lieutenant Marshall states that the Ganges Canal obstructs the drainage of 70 square miles in the Moozuffernuggur District. From the 7th to 12th instant there had been almost incessant rain over this tract, and, on the morning of the 12th, I had an opportunity of measuring with fair accuracy the amount of water that was running off through several large inlets made on purpose into the

canal, which was closed at the time, and found it to be nearly 660 cubic feet per second. I hope before another season to have submitted to Government a project for relieving these 70 square miles. The distress caused in some villages by inundation has been, I am sorry to say, very great. This allowance of 9 cubic feet per square mile is pretty nearly the present flood-discharge of the West Kalee Nuddee according to Lieutenant Marshall.

11. Nor do I think we need consider at present the advisability of building a second bridge on the road from Moozuffernuggur to Shamlee, in order to give increased waterway to the river, and I am sorry Lieutenant Marshall has bestowed labour on drawing up a design for it and estimate (No 6A.) appended to his report. It is sufficient to know that the present bridge is large enough for present purposes.

12. In paras. 20 to 22 Lieutenant Marshall mentions five places below Moozuffernuggur where swamps in the khadir to the right of the river have increased since the introduction of irrigation to the left, and he submits estimates, amounting to Rs. 740, of the cost of draining them, which, by Mr. Donovan's statements attached, would reclaim 264 acres of swamp, and increase the rental by Rs. 504. It seems extremely problematical whether the canal has anything to do with these swamps, and they are of very small extent compared to many others in the Doab, but if a rental of Rs. 504 is to be obtained by an outlay of Rs. 740, the investment looks too good to be neglected. Probably it might best be done through local agency, and without the interference of the Canal Department.

13. In the concluding paras. of his report he describes the river above Moozuffernuggur. In this part lies the Rehee Jheel now being drained. Above this comes the Seela Nudin which and six other sources the river has its rise. In these seven valleys rice cultivation is carried on, the water being held

up by a system of bunds; and Lieutenant Marshall's opinion is (para. 31) that they had better be left untouched.

14. As regards the improvement of the Seela Nullah, I have not yet obtained all the information called for in G. O. 1661I., of the 18th May, but I hope to do so, and to resubmit Lieutenant Marshall's project very shortly. It seems to me that it would be, on the whole, a good scheme to take up; but the urgency of the case is not so great as that of the Nagun Nuddee or sources of the East Kalee Nuddee. Lieutenant Marshall's project for improving this was submitted with my No. 1393, dated 3rd May last.

15. Lastly, Lieutenant Marshall's para. 32 is a brief recapitulation of the whole. The impression left on my mind after reading this report is that it contains very little new matter, and it is, I think, satisfactory to find that an intelligent officer after several months' close study of his subject, assisted by the local District and Canal Officers, should have found so few blemishes to repair. We now see that Lieutenant Marshall's appointment was hardly necessary, for the Canal Officers on the spot could have submitted the estimates he has done, but we did not know in November what evils he might not discover. I know he has done his duty in an earnest and painstaking spirit, of which the lines he has surveyed and the village statistics he has recorded are some proof; and I would respectfully submit that he deserves credit for his work.

3.—*Report on the Condition of the West Kalee Nuddee in the Saharunpore and Moozuffernuggur Districts, and also of that portion of those Districts which lies between the West Kalee Nuddee and the Hindun: by* LIEUT. G. F. L. MARSHALL, R.E., *Executive Engineer, Special Duty, Irrigation Works, dated Meerut, 20th April*, 1871.

1. At the conference held at Meerut on the 8th November, 1870, to discuss proposals for the drainage and improvement of

Saharunpore and Moozuffernuggur Districts, it was proposed by the Chief Engineer of Irrigation Works, North-Western Provinces, to appoint officers to inquire into the following points :—

Authority and object of the report.

"(*a*) To examine the amount of irrigation in over-irrigated districts, and to reduce it to an extent which shall prevent any water-logging both on the Eastern Jumna and Ganges Canals.

"(*b*) To discover and remove impediments to the outflow of drainage caused by canal works, and to record particulars of all others that are met with.

"(*c*) Also to examine the main out falls of the country, as the Hindun and Kalee Nuddees and their affluents; to discover obstacles to a clear outflow, both natural and artificial; to ascertain the quantity of canal-water which is poured into these outfalls at various seasons of the year, the amount of rain-fall which they are liable to have to carry off, and their capacity for doing the entire work demanded of them; and to propose measures of alleviation for any obstacles to a free outflow of drainage which they may discover. It is observed that the assistance of the Revenue and District Officers is materially important to the success of these inquiries."

To carry out these inquiries in detail, the Chief Engineer further proposed to divide the tract of country into three strips: that on the west, comprising the Eastern Jumna Canal irrigation; that on the east the irrigation from the Ganges Canal; and that in the centre comprising the rivers Hindun and Kalee, and the unirrigated country lying between them.

2. On the 9th December, 1870, I received instructions from the Superintending Engineer, 1st Circle of Irrigation, to undertake the investigations in the central or unirrigated strip, the objects of which are summarised under heading (*c*) (quoted above) of the proceedings of the conference.

General Description of the Tract.

Topographical features.

3. The country between the Hindun and the Kalee is a table-land, with a slope towards the south and east, the watershed running in a southerly direction near to the Hindun on the west side, and the greater portion draining itself naturally to the south and east into the Kalee Nuddee.

In the Saharunpore District the set of the land eastward is less apparent, and the table-land is cut up by several small nullahs flowing in deep valleys. At the border of the Moozuffernuggur District these nullahs have all collected into one considerable river, and the country between it and the Hindun has assumed the form of a raised, slightly undulating plain, with scarcely any well defined drainage-lines till the extreme south, where the rain-water collecting from above has cut several extensive ravines and nullahs in its passage from the high ground to the river.

Irrigation.

4. There is no canal-irrigation (except in a very small section of the Saharunpore District, which I have treated separately), and the crops are dependent upon rain fall and well-irrigation.

Crops.

5. The staple produce of the country is wheat. In the Saharunpore District a large quantity of rice is grown during the khurreef, but very little in the Moozuffernuggur District.

Villages sites conservancy, storage of manure.

6. The villages are for the most part well situated on sites raised a little above the general level. They are, however, as a rule, dirty and ill-kept. In almost every village manure was regularly stored by the people within the sites, and occasionally within the dwelling-houses. In a few, on the other hand, the site was particularly clean.

Geological formation.

7. The geological formation of the country is an upper stratum of sandy alluvial soil, varying from fifteen to fifty feet in thickness, and containing at intervals small patches of clay; overlying a stratum of the latter earth, which, as far as I can judge, is continuous, and of an average thickness of about twelve feet. Water is found both above and below this clay stratum—that above the clay being supplied by percolation, from the surface and limited in quantity, and that below the clay being supplied from a distance (probably from the boulder formation at the foot of the hills) and practically unlimited in quantity. The wells which have pierced the clay and draw their supply from below are used principally for irrigation; those which only reach the water above the clay are used as a rule solely to supply, drinking-water. A third class, coming across minor springs above the main clay stratum, have a rather better supply, and are used for both irrigation and domestic purposes The upper sandy stratum is irregular, and varies much in its character in places, being some times found so stiff that the perpendicular sides of a kutcha well stand for years, when a mile or so further on they will not even stand till the water is reached. The formation is also interspersed, as mentioned above, with irregular beds of clay, and here and there with kunkur.

The clay on the surface is invariably found in hollows, and is apparently formed by water lodging on the surface and puddling the soil gradually during the process of percolation.

As a general rule the soil on the level upland is stiffer, and in the khadirs near the rivers looser and more sandy. There is also a strip of dark soil stretching along the centre of the upland, with a northerly and southerly direction.

8. The whole country being dependent on wells for its water-supply—for all purposes, during some months of the

year, and for irrigation and drinking at all times—they are to be found in nearly every village. Where the lower springs are easily reached many wells are sunk to supply irrigation. By far the greater number, however, reach only the upper water stratum, and are uncertain and variable in their supply. They rise about one and a half to three feet in the rains and go almost dry in the hot weather.

The general level of the upper springs during the cold weather varies from eighteen to five and twenty feet below the ground, being as much as forty at some points on the water-shed. The lower stratum is met with at about forty feet down, and on being tapped rises to within about twenty-five feet from the surface.

Drinking-water.

9. The drinking-water is usually very good. About five-sixths of the population drink from pucka wells on the upper spring-level, supplied by percolation from the surface; about one-tenth drink from the lower springs; and the remainder drink from the river or from pools in its bed—this latter class being almost confined to the Saharunpore District.

Swamps.

10. Swamps are of two widely different classes—(1) In which the soil is stiff and the surface-drainage held up for want of an outlet; (2) in which the soil is porous and the spring-water rises above the level of the ground. Of this latter type, the tract contains none except at a few points in the khadir. Under the former head come village tanks and small ponds, which, receiving and retaining the surplus rain-water, serve to keep up the supply of the springs by giving the water time to sink into the soil. They also serve for watering cattle, washing clothes, and occasionally for a few beegahs of irrigation.

Surface-drainage.

11. The surface-drainage of the country is in its normal condition. No artificial works of any magnitude exist except the line of the

Punjab and Delhi Railway, which is amply provided with waterway; and there has been no interference with the natural flow of surface water.

12. In the Moozuffernuggur District, in consequence of the ill-defined character of the drainage-lines in the upland, a large proportion of the rain-fall, averaging about eleven-twelfths of the entire amount, is checked in its progress towards the rivers, and eventually, soaking into the ground, goes to maintain the supply of the subsoil-water.

In the Saharunpore District there are a few tolerably extensive jheels which might be afforded an outfall with some advantage, but it is a work of no pressing importance, as the spring-level stands from fifteen to eighteen feet below them, and their margins are used for the cultivation of rice. In this district the spring-level has actually subsided during the last thirty years. The places referred to are Bunhera-khass, Manikpore, Sakhun, and Bahlah.

13. The cultivation of rice is carried on to a very large extent in the Saharunpore District, while in this part of the Moozuffernuggur District, in which there is no canal-irrigation, there is scarcely any. Natural hollows are taken advantage of, and by covering the bottom of the hollow with a network of *kyaries*, the rain-water which collects is retained in manageable quantities, the overflow of each field passing on to the next lower one. Rice requires too much water to be profitably irrigated from wells, and if the rains fail the entire crop is lost. In the rice hollows, or "*dahars*," the spring-level stands usually about fifteen feet below the surface. If it were not for these rice *kyaries*, the surface-water would drain off with great rapidity, and the floods down below would be more sudden and violent. The people attribute no ill-effects whatever to the cultivation of rice, and strongly deprecate any attempt to drain the lands. The opinion of the zemindar, who is the owner of

Effects of, in the opinion of the people.

the crop, is of course a biassed one; but the chumars who work in the fields, and are exposed to the whole danger without any of the profits, show no reluctance to the task, and undertake it without any dread of incurring fever. Their testimony carries considerable weight. In almost every instance on inquiring from these men they gave as the causes of fever, in their opinion, the greater heat of the sun in the intervals of the rainy season, and drinking the stagnant jungle water whilst at work in the fields. In the north-west part where the rice cultivation is most extensively carried on, the fever had been lighter, more villages had escaped altogether, and the general aspect of the people was more robust and healthy than in the canal-irrigated villages and the more easterly portion of the tract.

Rain-fall.

14. A table is appended of the rain-gauges kept at eleven places in or about the tract, which show that 35·0 inches per annum is the average rain-fall. The greatest fall throughout the entire district at once was 2·66 inches and the maximum flood corresponding with that was 6,106·45. The catchment basin supplying that flood is 636·4 square miles, and the flood discharge due to that amount, if the whole were carried off, would represent an average for twenty-four hours (24 hours is assumed because the heavy fall took place in the south portion: for a general fall, probably 48 hours, would be required) of $26{\cdot}88 \times 2{\cdot}66 \times 636{\cdot}4 = 45{,}503{\cdot}10{,}912$ cubic feet per second. The maximum flood was in reality only between one-seventh and one-eighth of this, and the average flood during the 24 hours cannot have been more than one-tenth, though, without observations at the time and on the spot, it is impossible to calculate this with accuracy. Other calculations show that on an average one-eighth is an ample allowance in estimating amount passed off to waste under similar circumstances, and that at least seven-eighths, sometimes as much as eleven-twelfths, of the rain-fall is retained in the soil. The total

rain-fall, we have seen, is about 35·0 inches during the year. Of this the bulk is made up of light showers, of which more even is retained by the soil, and less in proportion finds its way to the rivers, than in the heavy falls, so that 4·0 inches is the outside of the surplus water that is carried off direct by the drainage lines, leaving 31·0 inches to be accounted for in filling the tanks, supplying the springs, moistening the soil by absorption, and the air by evaporation, and passing slowly through the soil maintaining the perennial supply of the river. From the evidence of the villagers, it appears that the water in sand wells shows an average rise of about two feet, more in the hollows and less on the ridges. This leaves a balance of 7·0 inches of rain-fall to water the cattle, and pass off by evaporation, and sustain the vegetable life at the surface of ground. This annual addition of two feet to the height of spring-level in the sand wells has produced no permanent effect on the springs; it is each year exhausted by the people in the dry weather to be replenished again in the rains, and is just barely sufficient for the domestic uses of the inhabitants.

Effects of Canal.

15. The percolation from the canals has not affected the spring-level of this part at all. In some of the villages along the edge of the khadir the water is said to be a few feet higher than it used to be, but the river in a sandy bed lies between, and on crossing to the irrigated side a marked change in the level is at once apparent, so the probability is that the effect of the canal has been little if any.

Summary.

16. To sum up: the tract may be described as a table-land raised about forty feet above the rivers which drain it, with a dry and rather stiff sandy soil, with deep wells, dependent entirely on the rain-fall for its water-supply (except where the lower springs have been successfully tapped), and the prosperity of which is chiefly attributable to the fact that the conformation

of the land favours the retention of a considerable proportion of the rainfall instead of allowing it to pass to waste in rivers. Under these circumstances, if a regular system of artificial drainage were to be introduced, not more than half the rain-fall at most would find its way to the springs, and about one-third of the annual supply would be cut off from the upper water stratum, on which nearly five-sixths of the wells depend for their supply; and the natural consequence would be, that these wells, unless the demand on them were proportionately lessened, would, in a few years, become exhausted and dry up altogether. It is true there is still the lower stratum to fall back upon, but this is in many cases reached only with great cost and difficulty, and in almost every instance would at least double the expense of a pukka well. While the country is thus without artificial means of supplementing its water supply, so far from works for the rapid removal of surface water being necessary, any natural impediment to its flow enabling the soil to take up more moisture in its passage is actually beneficial, and in this way the cultivation of rice forms one of the main sources of replenishment to the wells.

Irrigated portions of the districts.

17. Leaving the unirrigated portion in which my inquiry lay and crossing over to the left bank of the Kalee, which is extensively irrigated by the Ganges Canal, a change in the physical aspect of the country became apparent. The natural supply of the upper stratum has been augmented without adequate provision for the passing off of increased surface water having been carried out. The amount of water poured on to a canal-irrigated district, taking 1 cubic foot per second as irrigating 276 acres, and one-half of the total area as under irrigation, and the rajbuhas to be running 300 days in the year, we have 1·16 cubic feet per second, 100,224 cubic feet per diem, and 30,067,200 cubic feet in the course of the year on each square mile. The total amount due to rain-fall on the same area is 81,312,000 cubic feet, so that by irrigation from canals the

amount of moisture on the country is increased 37 per cent., and the results of this have been—

Effect of the irrigation.

1.—The level of water in the wells has risen from ten to five and twenty feet higher than in similar positions on the opposite unirrigated side, and does not now get much lower in the dry season as was previously the case.

2.—Along the drainage lines in this part springs have begun to appear in the valleys, and the beds of the hollows are damper, and in many cases springs have become perennial, while in similar positions on the opposite side of the nuddee the hollows are still dry except after heavy rain. Both these points show a continued increase in the quantity of water in the soil, and they call for immediate attention as each year aggravates the mischief.

Remedial measures proposed.

18. The three principal lines by which the drainage from the left bank finds its way into the river, and in which the appearance of springs in the bed is most marked are—

I. *The Seela Nuddee.*—For the improvement of this river I have already submitted a project and estimate which, if carried out, should lower the proposed winter level of the water about three feet, and have a corresponding effect on the adjacent wells, and in the separate report for which I have given fuller details.

II. A nameless hollow, taking the drainage from Chuppar in the Moozuffernuggur District and falling into the Kalee above the railway-crossing, in the boundaries of the village of Rehee. For this I have submitted already a project for tapping the springs to a depth of five feet, and also carrying off the surface-water, with an estimate of the probable cost.

III. A hollow draining the high land to the east of Moozuffernuggur and falling into the Kalee near the Great Trigo-

nometrical Survey station of Beghurzpoor. A project for this has been prepared by the Executive Engineer, Northern Division, Ganges Canal.

Besides these three chief affluents are one or two minor ones further south, which have been taken in hand by the Executive Engineer of the Meerut Division.

And should the proposed Deobund Branch Canal be sanctioned and carried out, I would strongly urge the necessity for clearing and straightening the various drainage lines simultaneously with the commencement of irrigation.

Opportunity for noting effects on wells.

19. The clearing out and deepening of the three lines noted above ought to have a beneficial effect in lowering the water surface of the neighbouring wells; and careful measurements taken at intervals during the next few years would supply us with data on a subject of which little or nothing is known accurately at present.

Sanitary Condition.

Sanitary condition of the tract.

20. A large portion of this tract is subject to the usual intermittent form of fever of a mild type, which makes its appearance every year during the rainy season; some parts also seem to be nearly free from it, only a few cases occurring, and most of them explicable by special causes, such as over-exposure to the sun, bad food or water, individual liability to disease from weakness of constitution, &c., &c.

In some parts of the Saharunpore districts, chiefly among the irrigated villages, fever has been for the last few years (five or six in some) worse than it used to be.

In 1868 the irrigated villages on the banks of the Seela (Kullunder) Nuddee and simultaneously other villages at various points in the Hindun Kalee Doab in Saharunpore District were attacked by an unusual outburst of fever.

In 1869 the fever spread over the whole tract down into the Moozuffernuggur District, as far south as Moozuffernuggur itself (which, however, had previously, in 1867, been very severely visited), and, in the irrigated part, down into the Meerut District.

In 1870 the fever became much less severe in the irrigated villages, and in the central part of the Moozuffernuggur District. In the north part of this district and the central strip of the Saharunpore it remained unabated; and in the south of Moozuffernuggur District it appeared with great severity.

21. In 1817 an apparently similar sudden increase of fever of a more fatal type took place in these districts. I have found a few old men here and there who recollect it, but it is beyond the memory of the present generation. The official correspondence which took place with reference to it has been discovered among the old records of the Saharunpore Collectorate by Mr. G. R. C. Williams, the Assistant Magistrate, and this throws considerable light upon the subject. Though no irrigation existed at all at that time, the outbreak of fever was attributed to the nearness to the surface of the spring-level in Saharunpore. It was first brought to the notice of Mr. C. Donovan during his inquiry at the village of Tanda Muzra, where the water is 39 feet from the surface.

22. Again, twenty-six years later, in 1843, after the development of the irrigation of the Eastern Jumna, but before that of the Ganges Canal, a similar visitation occurred, which commenced west of the Jumna in the Kurnal District, and gradually overspread the upper portion of the Doab. A Committee consisting of a Medical man and two Engineer officers was appointed to investigate the causes, and their report, with the fullest detail, may be found in the late Colonel Sir Proby Cautley's book on the Ganges Canal, Vol. III. This epidemic is also remembered to this day in the Hindun Kalee Doab.

It will be seen from this that there have been similar visitations previously, and that they have been succeeded by intervals of comparative freedom from disease.

23. The general impression left on my mind after the inquiry is, that the last two years have been exceptional seasons, and that any general scheme for drainage or sanitation based upon them will rest upon a wrong foundation, the real stand-point being the average rate of mortality over a series of years. I have of course refrained from entering into any detail of the symptoms or types of disease, my education not qualifying me to give an opinion upon them, but I have in each village that I visited noted the general prevalence of disease and such points of physical condition as seemed to bear on the sanitation in each case. A tabular statement of these notes is appended to this report.

24. There are two points in which the general condition of the country has been altered within the last two or three years :—1st, The insufficient quantity and coarser quality of the food consumed by the labouring classes during the famine in 1868 and in 1869; 2nd, the rather extensive felling of trees for the construction and maintenance of the railway.

Drainage of village sites by levelling and repairing the streets in the villages so as to prevent any water lodging round them, or in the actual site, would be beneficial. This is a work requiring only a little care on the part of the villagers themselves, and needing no engineering skill, but which it is hopeless to attempt to carry out so long as the people are themselves unconvinced of the advantages to be gained, and instead of co-operating with the District authorities in their endeavours, offer a passive resistance to all schemes for their benefit in a sanitary point of view. The absolute failure of measures carefully and energetically taken for the prevention of the storage of manure in the sites in parts of this district offer a disheartening comment on this view.

4.—Report on the West Kalee Nuddee.

1. The chief point laid down in my instructions for investigation was the capacity and condition of the main outfalls of the tract, and the extent to which they have been affected by the introduction of canal-irrigation.

2. A rapid inspection at points along the course convinced me that the Hindun, a large river, flowing in a broad sandy valley, afforded an amply sufficient outfall for all that could be poured into it; and as it was much less within the influence of irrigation in its course through Saharunpore and Moozuffernuggur than the West Kalee, I devoted my attention entirely to this latter river, which, in fact, drains about three-fourths of the tract in which my investigations lay.

Description.

3. The West Kalee Nuddee is a perennial stream, taking its rise about 15 miles from the foot of the Sewaliks, in the table-land between the Hindun and Solani rivers, where they begin to diverge. It has seven heads or sources, the various channels from which all converge towards the borders of the Moozuffernuggur District, before entering which they unite to form one considerable river with a wide khadir or valley, and a distinct and regular bed. I propose to consider this lower portion first, next the minor affluents on the right bank, and, lastly, the upper channels which form the sources of the nuddee.

	Square Miles.
The total area of the catchment basin of the Kalee Nudee as it now stands is ...	706·4
Of this amount 70 miles has been artificially added by the construction of the Ganges Canal, which crosses the left watershed twice at Bhaloolpoor and below Serai, and thereby sends water to the West Kalee instead of the East Kalee, but the drainage	

	Sq. Miles.
water at present is let into the canal, and a project is in preparation for turning it into the Khutaolee Escape and West Kalee Nuddee, ...	70·0
Leaving the actual natural drainage area, ...	636·4
Of this, again, the right main rajbuha cuts off 94·5 square miles, giving an aggregate waterway of 18 lineal feet, ...	94·5
Leaving a total area unimpeded in any way by canal works of ... .:.	541·9

In the calculation respecting the present state of the river 636·4 square miles is taken as the basis; and in those for the future capacity the full area of 706·4 square miles is taken into account, for an estimate is already in hand for affording an outlet for the additional 70 miles through the Khutaolee Escape into the Kalee Nuddee. This drainage area is of a maximum length of 54 miles, a maximum width of 18·7 miles, and an average width of about 14 miles.

4. The outfall is into the Hindun river below the village of Nugli Raoli, and is fairly clear; there are the usual deposits of silt at the junction formed by the rivers alternating in flood, but during the cold weather there is very little backing up, and the uniform velocity of the river lasts till close up to the junction.

Slope of bed.

5. Thirty-two miles on the curve above the junction of the river with the Hindun it is crossed by a pucca masonry bridge opposite to Moozuffernuggur, on the Shamlee road. As the flood-marks were very distinct there, and afforded an accurate stand-point, I have taken it as a basis for the calculations. The fall from this point to the last section, which was taken just above the influence of the Hindun back-water, is about 36 feet, giving a slope of $\frac{36}{31} = 1{\cdot}16$ feet per mile, or a fall of one foot in about

4,548 feet. This fall, though very small, is apparently sufficient and adapted to the looseness of the soil through which the river passes.

6. The cold-weather discharge is about 90 cubic feet per second at the bridge, and 120 cubic feet per second at the outfall. It flows in a very regular channel about 70 feet wide, with an average depth of about a foot and a half, and with a velocity of rather more than one foot per second.

Cold-weather discharge.

There are very few weeds or silt banks, and the channel is almost uniform in section.

The list given in the margin of the greatest depths at ten different points, casually selected along the course for sections, will give some idea of the regularity of the bed. There are numerous ghats for crossing the river between villages, which are mostly in good condition and passable by laden hackries. The surface-water stands in the cold weather about five feet below the banks on an average. The khadir land is sandy, chiefly under cultivation with wheat, dry, except in a few places noted further on, and with a good slope towards the river.

	2·62
	2·25
	2·30
	2·78
	2·06
	2·10
	2·05
	2·58
	1·90
	4·17
10)	24·81
	2·48

As it at present stands, the river in this section during the cold weather is in excellent condition: its course is even and regular; its banks are well defined; its ghats are firm, and not too deep; and its section and velocity well suited to the nature of the ground.

The next point to be considered is its present capacity to fulfil the extra demand made on it during the rainy season.

7. The discharge at the Shamlee Road Bridge, calculated by Colonel Dyas's formula, is 4,518·385 cubic feet per second;

the velocity computed is 3·492 feet per second. This is within the mark, for there is no cutting out of any description below the bridge, and the area is trustworthy for the flood-marks are distinct. The bridge has three spans of 53′ 6″, 55′6″, and 55′, with areas of flood-sections, 340·2, 477·95, and 540 feet respectively.

8. The discharge at the tail, calculated on the the same principle, with fairly accurate flood-marks, gives a top width of 830 feet, a section 2,617·65 feet, and a discharge of 6,106·45 cubic feet per second, with a mean velocity of 2·33 feet per second. The water received from the various affluents between these two sections is as follows:—

Received at Shamlee Bridge,		4,518·385
Bhumbara Nullah,	...	1,423·5
Nullahs under Gundoah,	...	3,056·
Local drainage from right bank,		225·
Ditto from left bank,	...	486·
Total,	...	9,708·885

The register of rain-fall shows that during the heaviest falls on the country draining in through the Bhumbara and Gundoah Nullahs, *no* rain fell in some parts, and very little in others, draining into the river above the bridge; and the flood discharge calculated from the section (6,106·45 cubic feet per second) is probably the largest amount ever passing that point. From these calculations it will be seen that the maximum flood discharge at present carried off by the lower portion of the Kalee Nuddee averages between 5,000 and 6,000 cubic feet per second.

9. Five general sections of the khadir accompany this report, showing the top width of the flood and extent beyond the banks submerged during the rise of the river. The land thus liable to flooding is not of course available for khurreef crops, but the formation of the khadir is such that there are very

few hollows, and those of limited extent, in which pools are left by the receding water.

10. In a country subject to a tropical rainy season, the rivers must always be liable to heavy floods, and granting the impossibility of avoiding floods, the khadir of the West Kalee is adapted for passing them off rapidly with the smallest amount of damage to the adjoining lands, and I did not perceive any traces left during the cold weather of ponding or injury done by flood-water during the rains, except in a few instances to crops sown within the well-known flood limits on the chance of their succeeding, and which should never have been there at all. An examination of the sections which accompany will render this point clear.

Former condition of the Kalee.

11. The present condition of the river is satisfactory. It remains to consider its former condition and to discover to what extent it has been altered or affected by the irrigation of lands and construction of canal works along its left bank.

There are three ways in which canal works affect the drainage lines in their immediate vicinity :—

1*st*,—By direct discharge of escape-water into their channels.

2*nd*,—By percolation through the soil from the main channels, or from the watered fields.

3*rd*,—By increasing the maximum flood, by keeping the land in an artificial state of moisture, which causes a larger proportion of the rain-fall to run off and reach the drainage lines direct, instead of soaking into the ground.

Rajbuha escape.

12. With regard to the first point, there are five rajbuha tails, and one unused canal escape, discharge themselves into this river. The rajbuhas contribute an average supply of about two cubic feet a second each. No register of gauges has been kept at the tails, so that the exact

amount cannot be ascertained, but on inspection and inquiry I found always a small quantity, sometimes a mere dribble, going to waste. After any rain, or anything causing a sudden cessation of irrigation, an increased amount, at times almost the entire discharge, passes into the river, but only until the rajbuha can be closed at the head, which is done with all practicable speed. These occasional rises render the ghats impassable, but as the occasions on which they occur are only during rains, the ghats are rendered impassable independently of the rajbuha water, which bears only a small proportion to the entire amount. The water poured in in this manner is perfectly clear and free from silt, having previously deposited in the rajbuha all the soil held in suspension when it entered the head. I do not see anything objectionable from a *drainage* point of view in thus tailing the rajbuhas into this river; nor do I think that there is any necessity for discontinuing the practice.

13. There is, in addition to these five, an escape from the main canal at Khattaoli, which enters the river below the village of Kheri Tugan. It is partly an excavated and partly a natural channel, in the bed of which flows a perennial stream, giving a minimum supply of about ten cubic feet per second. The head of the escape is now closed and used as a landing-wharf, and I can get no record of when it was opened. There is a tradition that it was used once, and a very vivid recollection of it remains in the minds of the inhabitants of the villages below, but it is long since it was opened, and it has fallen into such complete disuse now that it may be left out of the consideration as a direct agent in increasing the discharge of the river.

14. II.—The next point is the percolation from the soil. This has undoubtedly increased the discharge of the river, but the extent of the increase is difficult to ascertain. The Kalee was a perennial stream of some magnitude two hundred years ago; this is proved by Aboo Kumbo having endeavoured to conduct it by a canal to Meerut—a distance of some five and

twenty miles. The increase due to the canal has taken place during the present generation, and the almost universal testimony of the Natives is to the effect that the ghats which now take a man up to middle of the thigh reached formerly to just below the knee; and, in the absence of tangible data, I think we may conclude that of the 120 cubic feet per second, about 50 are due to canal percolation. This increased discharge has, however, affected the river in no injurious way whatever.

15. III.—The third effect of canal-irrigation—that of increasing the floods—may be left out of the question; the uplands are so confined by the network of kools and water-channels, crossing and recrossing drainage, and the soil is so porous and irregular that the rain-fall has been more than ever soaked into the ground; and the flood discharges in the rivers have been, if anything, lessened.

16. If surface drainage works are caried out on any large scale they will increase the flood discharge considerably.

According to Molesworth, in England six-tenths of the rain-fall is available for storage.

In this country, with its gentle slope and sandy soil, probably not more than ·40 would be carried off even under a complete drainage system.

Besides this, nearly 100 square miles of the northern portion of the basin can never come under irrigation under the present system, and will therefore be omitted in any drainage scheme. On this account an allowance of ·33 of the rain-fall would represent the total amount that the river would have to carry at once, when every facility has been afforded for passing off the surface drainage. This gives a maximum discharge of 16,282·4 cubic feet per second at the tail, and of 12,048 cubic feet per second at the bridge opposite Moozuffernuggur. Above the railway bridge the increase would be much less in proportion, as the whole of the unirrigable land lies in that section.

17. Cross-sections at five different points below the Shamli Road Bridge accompany this report, showing the positions of the flood-level with increased discharge, the present maximum flood-level and cold-weather level of the river.

Cross-sections of Khadir.

The first, taken at Nugli, two miles above the junction of the river with the Hindun. This shows that an additional rise of 2·49 feet, which increases the top width, and consequently the land liable to occasional submersion, by 370 feet, would carry off the highest flood estimated at 16,000 cubic feet per second.

The second, at Anchouli Ghat, shows that the estimated discharge of 15,000 cubic feet per second would be carried off by a rise of 1 foot, with an increased top width of 50 feet, with a clear outfall. At present, during high floods, the water at this point is held up by the elevation of the khadir and narrowing of the bed of the valley, though the outfall is perfectly clear with low supply.

The third, at Jeeuna, shows that the estimated discharge of 13,000 cubic feet per second would be carried off with an increased rise of 2·27 feet, giving an extra top width of 230 feet.

The fourth, at Poor Baleean, shows that the estimated discharge of 12,500 cubic feet per second would be carried off with an additional rise of 3·30 feet, and an increased top width of 360 feet.

The fifth, below the bridge, shows that the water is held up there also during floods by the narrowing of the channel below, but that if a clear passage be provided below, a rise of one foot, with an increased width of 500 feet, would carry off the entire supply of 12,000 cubic feet per second.

18. It will thus be seen that an average width of about 300 feet of khadir land would, under these circumstances,

become liable to occasional submersion, which at present escapes. The Shamli Road bridge at Moozuffernuggur has a waterway of 164 feet, an additional width of 120 feet would be required to pass off the extra flood with safety to the structure. It is, however, so doubtful whether the surface drainage will ever be sufficiently developed as to cause these abnormal floods, that the question may be abandoned for the present; an estimate of the probable cost of improving the waterway, should it eventually become necessary, is appended.

No other masonry works cross the river within the influence of increased floods, except the railway bridge and the Saharunpore Road bridge at Mulera, both of which have ample waterway.

Villages.

19. The villages along the banks of the river are situated high on the bangur, or on the slope at the edge of the khadir; they are well out of the influence of flood-water, with the exception of the village of Dubbul, up to the outskirts of which a maximum flood would rise, and it might eventually become necessary to move a few of the houses. This, however, is a remote contingency, and has not been allowed for in the estimate.

Detail of Swamps in Khadir below Moozuffernuggur.

Swamps in Khadir.

20. The five places in which swamps are found in the khadir, are (see general plan of Kalee Nuddee), 1st, west of Dubbul; 2, east of Dubbul; 3, north of Morkohuka; 4, south of Jeeuna; 5, between Jeeuna and Poorbaleean.

These swamps are occasioned by the appearance of spring-water at the surface. They are said by the villagers to have increased considerably since the canal came on the other bank, and the settlement records bear out their statement, but as the whole of them stand at a higher level than the river, which lies in a sandy bed between them and the irrigated lands, it is far

more probable that the increase is due to an intermittent action of the springs than that percolation passing under the river should find its way up to that level. Swamps have always more or less existed in those places.

21. All these swamps, except the one between Jeeuna and Poorbaleean, in which the soil is too stiff, admit of easy drainage; estimates of the probable cost are attached; also statements of the amount and value of the land to be thus reclaimed.

22. It is a doubtful matter whether the canal has had anything to do with these swamps. I am inclined to think not; but the fact remaining that they have increased in area since the opening of the canal, whether the cost of reclamation may fairly be charged to the zemindars, who will reap the benefit of it, is an open question.

23. Besides these five places on the right bank, there are two places on the left or irrigated bank at Samouli and Naolah, where swamping to a small extent occurs; but as these have already been taken in hand by the Canal Department, they call for no further comment.

24. Beyond this there are no indications of swamping of any moment. A few small hollows, the remains of an old bed of the river at the angles of its present course, are marked by the stunted appearance of crops growing on them. There are also some patches of reh land, and a small extent of waste land, but the remaining parts are sown with wheat, sugar-cane, jowar, or barley, and appear in a fertile and prosperous condition.

Upper portion of the River.

From the Shamlee road bridge to the junction of the Seela Nuddee.

25. From the Shamlee Road bridge upwards to the junction with the Seela Nuddee, the condition of the river is equally good; the bed is even and regular, the current is unimpeded by obstacles, the khadir is sandy, and as a rule, higher above the river-bed than in the lower portion.

It will be affected much less in proportion by drainage schemes as the whole of the unirrigated tract falls within its area. It is crossed by only two masonry works, both of which have more than sufficient waterway.

Swamps.

There is one very large swamp in its khadir in the villages of Rehee and Budiwala, for which a separate report and estimate has already been submitted.

There are also two minor swamps of very limited extent, one on the left bank, below the railway bridge, and the other on the right bank, in the village of Rohana; these have not been estimated for.

Capacity.

Slope.

26. This section is quite capable of carrying off the entire supply due to it, and requires no alteration or improve ment. The length on the curve is. 15¼ miles, and the fall is 26 feet, giving a slope of 1·705 per mile. The effect of this increased slope is shown in a slight tendency to scour and form rapids, but to no injurious extent; any straightening of the river here would cause immediate erosion of the bed. In the upper portion weeds grow at the sides of the channels.

Sources and Upper Branches of the Nuddee.

27. The last point to consider is the condition of the upper portion of the river from its sources to the junction of the last perennial affluent, the Seela Nuddee.

The West Kalee has seven heads or sources, all in the Saharunpoor District (*vide* sketch plan):—(1) The West Kalee; (2) The Dhoonkeewala Khala; (3) 2nd head of Dhonkeewala; (4) Dhurmpoor Khala; (5) Dookchara Khala; (6) Jhubrera Khala; (7) Seela Nuddee.

Of these the Seela Nuddee in its perennial portion has already been treated of in a separate report, and an estimate submitted of the probable cost of its rectification.

The remaining portions are sufficiently similar in their general aspect to be treated of simultaneously.

28. They commence each in a slight hollow or "dahar," which is carefully cultivated with rice. After a certain distance of rice cultivation, varying from half a mile to about three miles, according to the slope and extent of the valley, the rain-water gets beyond the control of the kyaries, and cuts out a channel commencing with a sudden drop which cuts back from year to year. To prevent this cutting back is the chief object of the owners of the adjacent rice-fields. The channel thus commenced follows a tortuous course in the bottom of the valley, getting wider and deeper in its onward course; but as yet quite dry, except after rain. In this portion bunds are occasionally constructed to provide drinking-water for the cattle, and also water for the dhobies to wash with. These bunds retain the rain-water in pools, which dry up by the end of April.

29. After a dry course of from three to ten miles springs begin to appear in the bed, and then for three or four miles the discharge is only about two or three feet a second. The bed is winding, irregular, and choked with weeds, and blocked at frequent intervals by bunds thrown across for irrigation of the fields bordering on the river. Proceeding onwards the valley gets deeper and narrower, and after about four miles, the water is generally too far below the ground to render an irrigation bund a feasible undertaking. From this point the rivers become better defined, and though the course is winding, and the velocity small, the water moves on without obstruction. There are a good many weeds in the upper part; they gradually get less and disappear altogether as the volume of the river increases.

30. The first heavy fall of rain washes out the bunds.

The spring-level does not appear to have risen during the last forty years on account of these bunds (*vide* register of villages).

The river water is from fifteen to thirty feet below the general level of the country.

The floods are not excessive and subside rapidly.

The soil is so extremely sandy that a current strong enough to prevent the growth of weeds would cause erosion of banks and bed, and render constant repair necessary to an artificial channel.

The people are in several places dependent on these bunds for watering their cattle.

The channels are numerous and far removed from the limits of canal-irrigation; which would render efficient supervision difficult.

Without efficient supervision any rule forbiding bunds would become a dead letter, and any expense incurred in clearing the channel be money thrown away, for the river would again adopt itself to the soil and slope, and weeds would re-appear.

31. Taking all these points into consideration, and also the doubtful nature of any beneficial result to be anticipated from clearance of these brooks, and the absence of any proof that there is actual damage done to the country by the bunds, or that any evil results arise from the low velocity and growth of weeds where the quantity of water is small and in constant through slow motion, I think that the safer course will be to refrain from touching these portions of the river at all.

Recapitulation.

32. The conclusion at which I have arrived may be thus shortly summed up :—

Unirrigated district.

I.—1. That the central strip is free from swamps in the proper acceptation of the term.

2. That the spring-level there has not been affected by canal-irrigation.

3. That the sickness during the last two years has been abnormal, and that no general scheme altering the physical aspect of the country can fairly be undertaken in consequence of it.

4. That drainage schemes carried out in this tract, unless accompanied by artificial increase to the water-supply, would be a positive evil.

Irrigated district.

II.—1. That in the irrigated portion the spring-level has been raised considerably above its normal height.

2. That owing to the porousness of the soil, and its power of rapid absorption, the crossing of drainage by embankments shows very little heading of water or damage upon the surface, and, in consequence of this, sufficient attention has not been paid to providing exit for the surplus drainage.

3. That this has caused the beds of some of the main drainage lines, formerly dry, to become marshy or perennial in parts, and also the appearance at some points of springs in the khadir.

4. That to remedy this a complete system of surface drainage is requisite, not only avoiding interference with natural channels, but supplementing them also by artificial ones so as to get rid of the rain-fall as rapidly as possible.

5. That percolation from irrigation must always take place, but that as the slope of the main canal gets lessened, and erosion of the bed ceases, percolation from it will also cease.

Main outfalls.

III.—1. That the present condition of the main outfalls is all that could be desired.

2. That they are perfectly capable of doing all the duty required of them at present.

3. That in case of a complete drainage scheme being carried out in the irrigated country, the flood discharge will be largely increased, and that some additional flood-way will be required for the West Kalee.

Remedial measures.

Appended to this are the following documents:—

1. An estimate for the provision of additional flood-way to the West Kalee Nuddee. This work is not *at present* necessary.

2. A project for the rectification of the Seela Nuddee.

3. A project for the drainage of Rehee and Budiwala Jheels.

4. An estimate for the drainage of four minor jheels in the khadir.

5. A project for the clearing and straightening of both heads of the East Kalee or Nagun Nuddee.

These works, if carried out, will render the main arteries of the country capable of carrying the utmost supply that can ever be thrown into them.

They will form a basis on which all the minor schemes can rest, and the details of drainage in the upper portions may be undertaken from time to time without fear of bad consequences to the channels below. The additional flood-way to the Kalee need not be taken in hand till irrigation is extended to the right bank, and the whole drainage system matured. The elaboration of the minor drains will be a work of time, and could be carried out piecemeal, and I would suggest that in carrying them out deep digging be avoided as much as possible, merely clearing the surface to an uniform slope and removing obstructions.

G. F. L. MARSHALL, Lieut., R.E.,
Executive Engineer, Special Duty, Irrigation Works.

APPENDIX.

Calculation on the proportion of the rain absorbed into the soil under varying circumstances.

Proportion of maximum flood to rain-fall.

The Bhumbara Nullah is a large ravine, dry, except after rain, which enters the Kalee on the right bank about two miles and a half above its junction with the Hindun. It drains a total area of 13·25 square miles. The channel has a length on the curve of 4·4 miles, and a fall of 24 feet, giving an average of 5·45 feet to the mile; the greatest breadth of the catchment basin is 3·5 miles. The slope of the country is good towards the channel on every side; there are no artificial obstacles to the outflow. The soil, though sandy, is tolerably stiff, and with an admixture of clay in the upper portions, where there are several kutcha wells, and the general conditions are favourable to the passing off of drainage.

The maximum rain-fall is approximately taken at 6·0 inches from readings of surrounding gauges.

The average discharge required to carry this entirely off in 8 hours is 6,410·88.

The duration of the flood was probably less than 8 hours.

The actual maximum flood was only 1,423·5 cubic feet per second.

The average during 8 hours was probably under 1,000 cubic feet per second.

Thus the amount passed off by flood, even under these favourable circumstances, was only between 1-6th and 1-7th of the entire rain-fall.

The flood, calculated by Colonel Dickens's formula, $D = 825 M^{\frac{3}{4}}$ when D. is the flood discharge and M. the catchment basin in square miles, gives 5,729 cubic feet per second, or nearly four times the actual maximum amount by flood-marks and sections under the above circumstances.

The Gundoar Nullahs drain the entire tract of country from Chitawal, in the Moozuffernuggur District, down to Shahpoor, which is the most typical portion of the central strip; the country is slightly undulating, and the drainage lines are scarcely perceptible till within five or six miles of the river. The soil is sandy, but very stiff in parts; and the greater portion is irrigated from kutcha wells about 22 feet deep.

It has a fall of 75 feet in about 25 miles, giving an average of 3 feet to the mile; the slope is much less in the upper portion and greater near the tail.

The area of the catchment basin is 84·1 square miles.

The greatest rain-fall over the whole area may be taken approximately at 4″, for the tables show that the heaviest falls are extremely local, and have a tendency to follow the course of the great rivers.

The average discharge requisite to carry off the total fall in 24 hours is 8,752·128 cubic feet per second.

The duration of the flood is taken arbitrarily, due regard being had to the length of the course and the nature of the soil.

The maximum flood calculated from section and slope was 3,056 cubic feet per second.

The average discharge during the twenty-four hours, from the verbal evidence of the villagers, must have been about one-third of this, say 1,050 cubic feet per second. This gives about one-eighth of the total amount carried off direct. The maximum discharge, by Colonel Dickens's formula, amounts to 20,910·25, nearly seven times the actual discharge.*

Discharge of the Kalee Nuddee at Moozuffernuggur.—The catchment basin here includes country of all types, both irrigated and unirrigated, level and undulating, and with slopes

* To show still further the variation in the amount of rain-fall passed off directly in various localities, this formula of Colonel Dickens's has been found to give very correct results in calculating the discharges of the sub-Sewalik torrents.

varying from one foot to 5 feet per mile. The soil also varies considerably in character in the different parts.

The area of the catchment basin is altogether 419·6 square miles.

The actual discharge during a maximum flood last year was 4,518·385 cubic feet per second.

The greatest amount of rain-fall over the whole area at once may be taken at 3″, though much more has fallen in particular localities.

The greatest length of the basin is 37 miles on the straight.

The duration of the flood was probably about 36 hours.

The average flood necessary to carry off the whole rain-fall in 36 hours equals 22,557·696 cubic feet per second.

The actual average discharge was probably less than half of the maximum floods, or about 2,250 cubic feet per second, from which it appears that in this instance about one-tenth of the fall was carried off.

Total Discharge of the Kalee.—The calculations for this are given at page 11, para. 18, and show a somewhat similar result.

Section.	Area of basin.	Amount of rain.	Duration of flood, about.	Actual maximum flood.	Probable average flood.	Average flood due to entire fall.	Proportion.
	Sqr. m.						
Bhumbara Nullah,	13·25	6″	8 hours,	1423 5	1000	6,410·88	$\frac{1}{6}$ to $\frac{1}{7}$
Gundoar Nullah,	84·1	4″	24 „	3056·0	1050	8,752·178	$\frac{1}{8}$ to $\frac{1}{9}$
Kalee above Moozuffernugger,...	419·6	3″	36 „	4518·385	2250	22,557·696	$\frac{1}{10}$
Total, Kalee, ...	636·4	2″·66	48 „	6106 45	2500	27,751·5	$\frac{1}{11}$

From the foregoing calculations, it will be seen that over the entire area, under the present circumstances, only about between one-eighth and one-ninth of a maximum fall finds its way direct to the rivers, the proportion for an average fall being far less.

Art. IX.

REGISTERED PUBLICATIONS DURING 1871.

1.—*From* M. KEMPSON, ESQ., M.A., *Director of Public Instruction, North-Western Provinces, to* C. A. ELLIOTT, ESQ., *Secretary to Government, North-Western Provinces* (*No.* 3089):—*Dated Lieutenant-Governor's Camp, the 20th February*, 1872.

I HAVE the honour of submitting for His Honor's information the Catalogue of the publications registered at Allahabad under Act XXV. of 1867 during the year 1871, with the following remarks:—

2. The number of entries in the Catalogue is 700—that is, 120 in excess of the total for the year 1870. The details are shown in the margin, from which it appears that the increase is due to the larger number of books and pamphlets registered. The entry under "Periodicals" gives no indication of the actual issues under this head, because all the publishers do not register. This irregularity is of less consequence now that the Resolution of the Government of India, No. 5605, dated 21st December, 1871, has modified the provisions of the Act. Para. 4 of the Resolution intimates that "newspapers . . . which are exempted from delivery under Section 9, should neither be purchased for preservation, nor registered in the Catalogue." Para. 1 of the Resolution will affect the future registration enormously. Eleven exemptions are thereby legalized. The last ten of these exemptions were recommended by this Government when the Act was published, but the first—*viz.*, "reprints of books without additions or alterations and without new notes.

Classification.	1870.	1871.
Books, ...	209	317
Pamphlets, ...	180	243
Periodicals, ...	151	120
Miscellaneous, ...	40	20
Total, ...	580	700

or commentaries"—will deprive the Catalogue of its usefulness as an index of the public demand for books, whether religious, general, or professional, and of the activity of the various centres of publication. We shall have fewer materials than before for estimating the degree of attention which is paid by the several classes of the community to these subjects—a point which is always interesting, if not important. It is curious, for example, to note that two and a half times the number of Persian and Arabic books are registered this year—*viz.*, 108 against 40.

The Arabic books alone are five times as numerous (52 against 11). Twenty-three thousand copies of the Koran, or parts of it, have been published, a large number when the demand for general literature is next to nothing. Nineteen Arabic Grammars and seven Treatises on Logic, averaging 1,000 copies each, have been reprinted. Last year's Catalogue showed nothing of the kind. The working of the Act is more or less incomplete of course, as must be the case where the subjects of a Government do not co-operate cordially with its legislative action; but nevertheless, I think the figures above quoted indicate increased mental activity among the Mahomedans.

The supposed educational wants of this section of the community received a considerable share of public attention during the year, and it is possible that this has not been without stimulating effect. But so far as the indications of the Registration Act are concerned, the movement is strictly conservative, and points to revival, rather than reformation or the acceptance of new light. In connection with these remarks it is worthy of record that a liberal prize was recently offered by an influential Mahomedan for the best essay on the subject. The result was strange in one way, for the adjudicators preferred the essay of a youth now at school, who borrowed from English books, to the utterances of several competitors of learning and experience. If the offer of a prize was intended to elicit suggestions for reform, and the award

was made on this principle, one inference from the result is that Mahomedan learning and experience are unfavourable to reform in the sense of abandonment of old paths. Youth and inexperience are less scrupulous.

3. The marginal statement given in the foregoing paragraph gives 317 as the number of books registered. I have distributed these below according to languages and subjects :—

Classification.	*Languages of Publication.*							Totals.	Totals—1870.
	Hindi.	Urdú.	Sanskrit.	Persian.	Arabic.	English.	Bilingual.		
Religious, ...	11	19	4	3	20	2	26	85	48
Educational and Moral, ...	27	38	0	31	27	16	8	147	80
Poetical, ...	1	7	0	14	0	1	0	23	36
Professional, ...	7	20	0	5	2	13	0	47	22
Miscellaneous, ...	2	4	0	3	3	2	1	15	23
Total ...	48	88	4	56	52	34	35	317	209
Total in 1870, ...	52	81	6	29	11	12	18	209	...

4. As to languages, it appears from this statement that the number of books published in the vernacular is much the same for both years, but those published in Persian, Arabic, and English, and in a classical language, with translation in the vernacular, are considerably more numerous this year.

The *proportion* of vernacular works published (*viz.*, 43 p. c.) is 20 per cent. less this year on account of the increase of those published in Persian and Arabic, which are 34 per cent. of the whole instead of 19 per cent. last year.

The numbers of copies of the works published are shown in the margin. According to this reckoning the number of copies of vernacular works published is 53 per cent. of the whole, the number of Arabic and Persian, 30 per cent., and of Eng-

Hindi, ...	115,804
Urdú, ...	119,435
Sanskrit, ...	4,100
Persian, ...	65,025
Arabic, ...	67,075
English, ...	49,480
Bilingual	19,900
Total, ...	440,819

lish, 11 per cent. The altered proportions are of course due to the fact that the vernacular works are chiefly educational, and consist of larger editions.

Of 35 bilingual works 24 are Sanskrit, with a vernacular rendering, either Hindi or Urdú, attached. Among the rest, editions of the Koran, with an interlinear Urdú version, are noticeable.

5. As regards subjects, I remarked last year that the number of books devoted to religious, moral, and educational topics, was 61 per cent. of the whole. This year they are 72 per cent., *viz.*, 46 per cent. educational and moral, and 26 per cent. religious. But, calculated according to the number of copies of each work published, of which the detail is given in the margin, it will be found that 60 per cent. of the whole are educational, and that religious works come next in the proportion of about 20 per cent. of the whole number of copies.

	Copies.
Religious, ...	... 90,475
Educational and Moral, ...	... 267,810
Poetical, ...	... 26,650
Professional, ...	... 41,934
Miscellaneous, ...	... 13,950
Total,	... 4,40,819

6. I inspected the books collected in the registration office in December, and examined those among them which seemed worthy of remark. The proportion of new books is extremely small. They are in the Vernacular and English languages, chiefly under the head of educational and professional treatises.

Of now books in the vernacular I reckon 40 in all, including "field exercises," &c., and of these books no less than 25 are due to His Honor's Prize Notification.

Of new books in English, a few are religious, and the rest are educational readers, printed at the Government Press, or professional treaties issued by the Roorkee College. The following are further details:—

7. (1) *Religious Works.*—Of 11 Hindi works 3 of 16,000 copies are Christian publications. The eight Hindi religious books

consist of only 12,000 copies; none of them call for remark. Of Urdú works of this class two relate to the Christian faith and are in the Roman character, the one a tract, and the other a new edition of the book of Common Prayer. Of 20 Arabic religious works four are theological treatises, and the rest editions of the Koran, printed at Newal Kishore's Press and at Meerut. Some of the editions are well lithographed, but the paper is always coarse. There are also four Korans, with an interlinear version in Urdú. The Urdú versions seem as immutable as the Arabic text.

(2) *Educational and Moral.*—Of 27 books in Hindi 12 are school-books printed at the Government Press—three editions of 10,000 copies each among them. The only work worthy of notice as a new book is Mr. Etherington's Bhásha Bháskar, 3,000 copies. The English edition of this work was noticed last year. The Hindi Grammar is an adapted version drawn up at His Honor's suggestion as a school-book. It has generally received favourable notice, and has been considered worthy of reward under the Notification. Notwithstanding a few minor defects and omissions, it is the best Hindi Grammar out. On debatable points, the author may well be allowed to have his own opinion. Of 38 Urdú books under this head, 14 were published at the Government Press, including two editions of 10,000 copies each. The work on morals, marked No. 3 in the Catalogue, deserves mention as a useful compilation. The *Mubádi-ul-Hikmat*, No. 555, printed at Cawnpore, is a prize book under His Honor's Notification, and is a compilation from existing Persian and Arabic works on Logic, by Moulvie Nazeer Ahmed. Nos. 423 and 426 are useful elementary school-books by the same author. The *Kanz-ul-Fawáid*, No. 283, is another product of the Notification. It is a clever book, well worth perusal. The *Silsilat-ul-ulúm*, Nos. 53, 54, and 55 are parts of a complete Mathematical series, being brought out by Moulvie Zaka-ullah of Dehli, formerly in the educational service under His Honor's Government. The translation of Euclid is fairly done, and in some respects superior to the

Tahrir Uqlaidus in use. An attempt is made to distinguish between problems and theorems. This series will eventually prove useful for the extension of vernacular education as a branch of university teaching.

Of Persian works under this head, the majority are editions of the Gulistán, and the ordinary elementary books of Masdars, such as the *Masdar-i-Fayúz*. One of them, No. 424, is a new work on Elementary Persian Grammar by Moulvie Nazeer Ahmed. An edition of 1,600 copies of the *Ghayás-ul-loghát* (No. 259), at the cost of Rs. 6-8-0, has been brought out by Newal Kishore. Of 27 Arabic educational works, all are reprints of existing manuals of grammar and logic.

Of 16 English works, 11 were printed at the Government Press; among them a new series of Class Readers, edited by Professor Wright, of the Benares College. These are on their trial.

Among bilingual works I have entered two vocabularies, which are really trilingual-Arabic, Persian, and Urdú.

(3) The poetical works are chiefly reprints of current Persian authors. The Bostán is in great demand. Among Urdú books of poetry, I notice the works of Atish and Násikh, and a version of the Prem Sagar, illustrated. The solitary English work entered is Volume II. of Mr. Griffith's poetical version of the Ramayan. When I call it "poetical," I pay the highest compliment which a capitulation of this sort admits of.

(4) Professional works are 47 in number, with a total of 41,934 copies. This is a great improvement on former years.

The Hindi works under this section are 7 in number, four of which are military rules intended for the Native army. Two are medical.

Of the 20 Urdú treatises, one-half are legal, and consist of versions of Acts and Statutes, five are medical, and the rest military.

The five Persian works of 6,700 copies are all medical. The two Arabic professional works are on Mahomedan Law, and the English treat chiefly of Engineering. Mr. J. Elliot's treatise on applied mechanics (No. 347) is a valuable addition to practical science. I have seen no work on the subject which approaches it in neatness of solution. . The questions proposed for solution are taken from the Roorkee College examination papers for the most part, and deal with Indian practice.

(5) Among the few miscellaneous works, there is nothing specially worthy of notice. There are two editions of the Bágh-o-Bahár, one of the Urdú version of the Alif Laila, and one of the Prem Ságar in Hindi, the last poorly got up. Among the English works, I find a good translation of the Aráish-i-mâhfil by Mr. Court.

8. In conclusion, this survey of the issues of 1871 presents the following features for remark as regards Native literature:—

(1) Reckoned according to the copies of each issue, more than half the books registered are educational, and of these a large proportion are vernacular school-books, brought out by Government for the use of Government schools, which are attended chiefly by Hindús.

(2) Unusual energy has been shown by the Mahomedans in providing for their educational wants in their own way.

(3) The demand for religious teaching is greater among the last-named section of the community than the former.

(4) In the literature of the Hindús, the Mahábhárat and Ramáyan are still the most popular reading.

(5) In Persian the chief demand is for the works of Sádi for tuitional purposes.

(6) Medical works of the Oriental school are still in demand.

(7) There is little or no attempt at authorship except what is called forth by the hope of reward.

2.—*Note by* C. J. LYALL, ESQ., *Offg. Under-Secretary to Government, North-Western Provinces, on the Report by Director of Public Instruction regarding Registered Publications for* 1871.

THE number of entries in the catalogue has increased from 580 to 700. The increase is entirely under the heads of "Books" and "Pamphlets." The following are the figures for these:—

	1870.	1871.
Books, ...	209	317
Pamphlets, ...	180	243

The entries under "Periodicals" are, as previously remarked, no true index of the circulation, inasmuch as these publications, when they contain merely public news or comments on public news, do not require to be registered. The division into books and pamphlets, however, is exceedingly unsatisfactory. Among books are found such publications as the Court Fees Act, No. 153; a Treatise on Caligraphy, No. 324; a little brochure of 16 pp.; Geography of Humeerpore, No. 369, 12 pp.; ditto Jaloun, No. 370, 14 pp. While among pamphlets we find a translation of the Bhagavad Gita into Hindi, No. 111, pp. 109; a work on morals by Moonshee Bholanath called the Gulshan-i-Akhláq, No. 122, pp. 70; a religious work in Urdú called Faiz-i-Am, No. 186, pp. 152; a Manual of Veterinary Practice in Urdú and Hindi, No. 395, pp. 112; the Divan of Khwaja Muînuddîn Chishti, No. 612, pp. 93. As Mr. Kempson's report treats mainly of the books, and leaves the pamphlets but little noticed, this division is inconvenient: much of interest is passed over, and too great weight is given in the classification of books to particular points, which, if pamphlets were included, might take a different aspect.

The classification of subjects and languages, given by Mr. Kempson in his 3rd paragraph, is somewhat general. I have

endeavoured to exhibit a fuller synopsis of the publications classed as books as follows:—

Subject.	Urdú.	Hindi.	Persian.	Arabic.	English.	Sanskrit.	Sanskrit-English.	Urdú-Persian.	Urdú-Sanskrit.	Urdú-English.	Hindi-Sanskrit.	Hindi-English.	Arabic-Urdú.	Arabic-Persian.	Total.
Grammar, ...	2	3	9	13	1	...	...	...	...	...	...	...	...	4	32
Dictionaries and Vocabularies,...	2	1	2	1	...	...	1	...	...	1	...	2	...	...	10
Logic, ...	1	...	...	7	...	...	...	...	...	...	...	...	...	...	8
Science, ...	4	4	...	...	11	...	...	...	...	...	...	...	...	...	19
Geography, ...	6	7	...	...	..	...	..	..	...	...	...	...	...	...	13
History, ..	4	2	...	4	2	...	...	...	...	...	...	...	...	...	12
Morals, ...	3	...	...	...	...	...	...	...	...	...	1	...	...	...	4
Law, ...	10	1	...	2	...	...	...	...	...	...	...	...	...	...	13
Medicine, ...	6	2	4	...	...	...	...	...	...	...	...	...	...	...	12
Poetry, ...	11	5	12	...	1	...	...	...	...	...	...	...	...	...	29
Fiction, ...	10	6	...	...	...	...	...	...	9	...	8	...	...	...	33
Religion, ...	13	8	1	19	2	3	...	...	...	...	1	...	4	1	52
Educational, ...	5	6	...	...	12	...	...	...	...	...	...	...	...	...	23
Miscellaneous, ...	11	8	28	1	4	...	...	2	...	...	1	...	...	...	55
Total, ...	88	53	56	47	33	3	1	2	9	1	11	2	4	5	315

The totals shown in this statement do not entirely agree with those in Mr. Kempson's, partly owing to difference of arrangement. The sum of the books entered here is 315, whereas it ought to be 317; 2 books have been missed somewhere.

I proceed to notice the works in the order of subjects:—

Grammar.—Persian and Arabic, with Arabic explained in Persian, predominate; but these are for the most part reprints of the same works. The Sarf-i-Mîr and Nahw-i-Mir, and the Mîzân-us-Sarf of Sheikh Sadi, are the most numerous of the Arabic Grammars. While the Safwat-ul-Masâdir is almost the only book for Persian.

Dictionaries.—There are editions of the Ghiyâs-ul-loghât and Burhâni Qâtí in Persian, both well known works; a Sanskrit and English Dictionary by Pundit Ram Jasan, of Benares, and a Hindi and English Dictionary by the Calcutta School Book Society. The rest are vocabularies.

Logic.—The one Urdu work under this head is the Mubâdi-ul-Hikmat by Moulvie Nuzeer Ahmed. The others (7)

are Arabic treatises, most of them editions of or commentaries on Qutbi. One work (No. 584) includes 4 treatises—all discussions of Qutbi.

Science.—This entry might have been reduced to Mathematics. The Urdú and Hindi books are all arithmetical or geometrical treatises, andt he 11 English books are chiefly engineering publications of the Roorkee College. Here come the publications of the Silsilat-ul-Ulum, which have been hitherto exclusively mathematical.

Geography.—This includes some more issues of Mr. Wilkinson's very useful Urdú Geography, published by the Allygurh Institute, and 3 parts of a Geography of the World, by Ishree Pershad, published at the Government Press, which is probably an Educational Department work. The Jugrâfiya-i-Râjpûtâna, by Baboo Krishna Nund, is another book under this head. It has, I believe, received a reward from this Government. The Hindi works of this class are swelled by three or four little tracts on the geography of different districts in the North-Western Provinces, apparently published by the Superintendent, Government Press, for the Educational Department.

History.—Of the 4 Urdú books under this heading, one is a compilation from Rollins' Ancient History (a strange model to choose), published by the Allygurh Scientific Society, and another a sketch by Siva Pershad called Aîna-i-Târîkh Numâ. The other two are editions of the Araish-i-Mahfil, which is really an Urdú version of the opening chapters of the Khulâsat-ut-Tawârîkh, although entered in the catalogue as "An account of Hatim!" The two Hindi works are reprints of Siva Pershad's Itihâs Timirnâshak, read in our Vernacular Schools. The four Arabic works are all worthy books. They are—No. 273, the Futûh-ush-Shâm (translated "the Victories of Sham")—ascribed to Waqidi. The Futûh-ul-Ajam (No. 598), Futûh-ul-Misr (632), and the Mâghazi (630), all I believe authentic works of Waqidi. These are all published by Nawal Kishore of Cawnpore.

Morals.—Here there is nothing to note.

Law.—The Urdú works are all translations of Acts and Orders. The two Arabic books are on Mahomedan Law, one being the well-known Sirajiya (catalogue (290) calls it Siraji).

Medicine.—Six Urdú, 2 Hindi, and 4 Persian: most of the first and last are collections of prescriptions (Qarâbâdîn or Mujarribât).

Poetry.—The 11 Urdú works are merely reprints of popular poets, such as Atish, Nâsikh, &c. There are some translations as, *e.g.*, the Sikandarnâma and Shâhnama, but nothing to note. The Hindi poetical works are nearly all portions of Tulsidâs' Ramayan. The Persian works are mainly reprints of well-known authors. One Persian version (No. 589) of the Bhâgavat is noticeable. Another notable work is the collection of Amîr Khusrau's Divans (No. 636). This has been I think for the first time printed, and is well got up; but being the text of only one MS., cannot be sufficiently accurate. The Sâqînâma of Zuhûri (No. 603) is another book worthy of notice. Among pamphlets I remark the Divan of Khwaja Muînuddîn Chishti (No. 612). This is a new discovery; it is a text taken from a MS. found in Rajputana by Nawab Murdan Ali Khan, of Jodhpore, and said to bear the seals of Abul Fazl and Faizi in proof of its genuineness. From what I have seen of the book, I should be inclined to doubt its being the work of the Saint. It is too frankly mystic, and the style too poor to give it a place among classical Persian poetry. It resembles the well-known Tarjih band called "Mâ-muqîmân," and seems to be of the same age, and modern. Nizami and Sadi make up the remainder of the Persian poetical books. The absence of Arabic poetry is striking. Mr. Griffith's Ramayan is the only English poem.

Fiction.—Here there is nothing to note. The 9 works entered under Urdú and Sanskrit, and the 8 under Hindi and Sanskrit, are parts of a serial issued by an Agra Editor, containing stories from the Mahabharat called respectively Makhzan-i-

Mahabharat and Saddharmâmrit Varshinî. In Urdú there is one translation of the Alif Laila (probably a reprint of a work I saw 4 years ago at Meerut), and 2 or 3 editions of the Bágh-o-Bahár.

Religious.—Under these the Urdú works are mainly controversial, written either by Missionaries against Islam and Hinduism, or by Mohamedans against Hindús or other Moslem sects. The Hindi works are either Missionary publications or Hindú mythological works. The Arabic are editions of the Koran or parts (*pâras*) of it, which are very numerous; four of these have Urdú translations attached.

The works which I have set down as *Educational* are only those which cannot be brought under any of the other special heads. The Urdú and Hindi works are chiefly auxiliary to the cause of female education. The 12 English works are readers in prose and verse, brought out by Messrs. Kempson and Wright for use in schools.

The *Miscellaneous* heading is large. In Urdú, Hindi, and English military orders and hand-books are numerous. The Persian list is swelled by a very large number of editions of the Gulistan, the Bahâr-i-Dânish, and other popular books.

I attempt below a classification of pamphlets according to subject and language:—

Subject.	Urdú.	Hindi.	Persian.	Arabic.	Sanskrit.	English.	Urdú-Persian.	Urdú-Arabic.	Urdú-Sanskrit.	Urdú-English.	Urdú-Persian-English.	Hindi-Sanskrit.	Persian-Arabic.	Total.
Religious, ...	26	12	2	1	2	4	1	6	...	...	...	2	...	56
Moral, ...	2	...	1	...	...	...	...	...	...	...	...	...	...	3
Educational, ...	5	3	18	...	...	...	...	...	...	...	...	1	...	27
Grammar, ...	3	3	6	4	1	...	...	...	...	...	...	...	...	17
Vocabulary, ...	1	...	4	...	...	...	1	...	...	...	1	...	1	8
Mathematics and Surveying,	3	5	..	...	...	1	...	...	...	...	...	...	...	9
History, ...	..	2	...	...	...	...	...	...	...	...	...	...	...	2
Astrology, ...	1	6	...	...	...	...	...	...	...	...	...	1	...	8
Poetry, ...	10	14	15	...	...	...	...	...	...	...	...	...	...	39
Fiction, ...	7	9	...	...	...	...	...	...	...	...	...	...	...	16
Miscellaneous, ...	15	9	3	...	...	24	2	...	2	1	...	...	...	56
Total, ...	73	63	49	5	3	29	4	6	2	1	1	4	1	241

(Here also there is a deficiency of 2 compared with the number given by Mr. Kempson (243).

It is noticeable how very largely religious publications predominate in this table. The Urdú books of this class are for the most part expositions of Moslem doctrine by Mohammedans, a few are by Hindús, and a third set are Missionary books. But the first are by far the most numerous. The Hindi are mythological.

The moral division includes a creditable book by Moonshi Bhola Nath, of Meerut, called the Gulshan-i-Akhlâq, which, though not successful in obtaining a prize under His Honor's Notification, seems to have a considerable sale. The educational pamphlets show a great preponderance of Persian—18 out of 27. Almost without exception these are books of *Insha* or style in letter-writing, and are repeated editions of only a few well-known books. Most of the Urdú works under this head are also on *Insha*, and one Hindi pamphlet, called Patra Mâlikâ, the first of the kind, I imagine.

Under "Grammar" the Urdú and Hindi entries are merely alphabets. The Persian include a book named above as classed among "books" the Safwat-ul-masadir.

The Persian vocabularies are all reprints of the Khâliq Bâri of Amir Khusrau. Mathematics, &c., include some manuals of surveying for the use of settlement officials.

History.—Two parts of one Hindi book called Prithwî Itihas: it seems to be a legendary account of India in the Puranic style.

Astrology, &c.—With one exception this science is patronised only by Hindús—omens, palmistry, and astrology, make up the class.

Poetry.—Under "Urdú" come some small editions of popular poets, and under "Hindi" two or three reprints of a

"drama" called "Indar Sabha." But under both the list is swelled by Barahmâsis or *Calendars*. These Barahmâsis are collections of verses, appropriate or inappropriate, arranged according to the 12 months, exactly like the well-known "Shepherd's Calendar" of Spenser.

Under "Persian Poetry" the bulk of the pamphlets consists of reprints of Sadi's Pandnâma, or Karîmâ (its first word), the first book a boy ever reads in an Indigenous School. I have mentioned Khwaja Chishti's Divan, which appears here, above.

Fiction.—A popular tale translated into Urdú and Hindi, and several times reprinted, called "Sipahi-zada-ka-qissa," swells these numbers. Under Hindi there is also a set of "the adventures of Bharathri," said to have been a king of Ujjain (Vikramaditya's younger brother, I believe, and like him a stock subject of fable).

The miscellaneous list is very miscellaneous indeed. Nearly all the English pamphlets (24 out of 29) come under this head. They are almost exclusively annual reports of Missionary operations, schools, &c.

(Excluded from registration by H. D. Notification 5605, of December last.)

The following table shows the number of books and pamphlets in each of the 6 chief languages :—

Bilingual.	Urdú.	Hindi.	Persian.	Arabic.	Sanskrit.	English.
54	161	116	105	52	6	62

This brings forcibly into view the increased activity in the Vernacular and Persian. Out of the bilingual publications only 6 have English as one of their languages, and all but 8 are partly vernacular; taking 46 of these as vernacular, we have a total of 323 works out of 556 either in whole or part in the languages of the country, or 58 per cent.

The proportion of Urdú to Hindi is 191 to 132, or 34 to 24 per cent.

Persian contributes 18 and Arabic 9 per cent.

According to subjects we find the following:—

	Urdú.	Hindi.	Persian.	Arabic.	Total.
Religious, ...	50	23	4	20	97
Poetical, ...	21	19	27	...	67
Moral, ...	5	...	1	...	6
Educational, ...	36	34	39	26	135
Law, ...	10	1	...	2	13
Medicine, ...	6	2	4	...	12
Fiction, ...	17	15	...	...	32

It is evident that, setting aside educational works, the demand for which is special, and is chiefly on the part of Government, religion and literature as represented by Poetry, Vernacular and Persian, are the subjects on which books are most in request.

3.—*From* C. A. ELLIOTT, ESQ., *Secretary to Government, North-Western Provinces, to* M. KEMPSON, ESQ., *Director of Public Instruction* (No. 1263A).—*Dated Allahabad, the 11th April*, 1872.

SIR,—I am directed to acknowledge receipt of your letter No. 3089, dated 20th February last, with which you submit, together with your remarks, the catalogue of the books registered under Act XXV. of 1867 at the Curator's Depôt during the year 1871.

2. I am to forward, for your information, copy of a note drawn up by the Officiating Under-Secretary to Government discussing the entries in the catalogues, and to state that your report, together with Mr. Lyall's note, will be printed in the "Selections from the Records of Government."

3. His Honor observes, with satisfaction, the increase in the number of books issued from the Press during 1871 as compared with previous years; although literary effort, both original and reproductive, is still painfully small, and indicative of the slumber of intellect in which the nation is wrapped.

	Books.	*Pamphlets.*
1870, ...	209	180
1871, ...	317	243

4. The vast proportion of the issues belongs to the Educational Department, and was published mainly under the orders of Government. On the side of the Mahometan community, there is a considerable number of religious works and reprints of the Koran.

5. His Honor notices, with pleasure, that some part of the useful portion of the publications is attributable to the stimulus given to authorship by the Prize Notification.

6. The comparative absence of works of an immoral tendency is remarked with satisfaction.

7. It is noted that leaving out of consideration the treatises issued by the Educational Department, Urdú and Persian are the languages which contribute by far the largest proportion of the issues of the year, while the works in Hindi are comparatively few.

8. I am to draw your attention to the very unsatisfactory manner in which the classification of the publications in the catalogue into books and pamphlets is carried out. No principle, with respect either to size or to subject, appears to guide the entry of works under one or other of these classes. Thus under "Books" are found such publications as No. 153, the Court Fees Act; No. 324, a Treatise on Caligraphy, consisting of 16 pp.; No. 369, the Geography of Humeerpore, 12pp.; No. 370, Geography of Jaloun, 14 pp.;—while among Pamphlets are entered No. 111, a translation of the Bhagavad Gita into Hindi, pp. 109; No. 122, the Gulshan-i-Akhláq, pp. 70; No. 186, the Faiz-i-Am, pp. 152; No. 395, a Manual of Veterinary Practice, pp. 112. Thus works deserving of notice escape observation by being classed with pamphlets, while others which are nothing but unimportant pamphlets swell the catalogue of books.

9. By the Notification of the Government of India in the Home Department, No. 5605, dated 21st December last, a large proportion of the works which have hitherto appeared

in the list of pamphlets will henceforth be omitted; and unless you can suggest some distinction between the terms obvious to the classifiers, His Honor would prefer that the division into books and pamphlets should be done away with, and all publications, not mere periodicals, entered in one amalgamated list.

10. The Lieutenant-Governor agrees entirely in your remarks with respect to the exemption from registration of reprints ordered by the Notification of the Government of India above referred to. It is clearly shown that the numbers of editions and copies issued of popular works illustrate in the most practical way the tendencies of Native study and reading, and if reprints were omitted, a valuable index to national thought and feeling would be lost. The point will be brought to the notice of the Government of India, with a view to the reconsideration of the orders; and, pending a reply from His Excellency in Council, I am to request that reprints may continue to be received by Registering Officers.

11. In conclusion, I am to convey to you His Honor's thanks for your interesting report, and to state that the Lieutenant-Governor agrees generally in the conclusions stated by you in the last paragraph of your letter. His Honor fears that there is only too much truth in your opinion, "that there is little or no attempt at authorship, except what is called forth by the hope of reward."

Art. X.

FEVER IN THE SOTE VALLEY IN PERGUNNAH SUMBHUL, DISTRICT MORADABAD.

1.—*From* C. A. DANIELL, ESQ., *Magistrate of Moradabad, to* HON'BLE R. DRUMMOND, *Commissioner of Rohilkhund, Bareilly* (No. 12).—*Dated Moradabad, the 16th January*, 1872.

I HAVE the honour to submit a further report on the fever in the Sote Valley in Pergunnah Sumbhul.

I have already in my letter No. 125, dated 19th November, 1871, stated what measures had been started to relieve the sufferers. I am now able to write more fully on the circumstances of the disease and its locality, on the mortality, on the probable causes of its rise and course, and on the measures carried out to help the sick.

2. The Valley of the Sote river in the Pergunnah of Sumbhul from the river's entrance in the north of the pergunnah has been the seat of the greatest sickness. The villages now reported on—79 in number—are situated on the length of about 20 miles of river by 2 to 3 miles on either side of the river.

The villages on the Sote to the south of the pergunnah were comparatively free from the severe type of fever, as well as those on the river in the Pergunnah of Amroha on the north.

3. Everywhere along the banks of the Sote, as well as on the Oril and other streams, cases are to be found where villages have been attacked with the usually prevailing form of fever of the months of September and October, but there has not been cause to take any unusual measures in any locality save the one now reported on.

4. The disease is said to have begun about the beginning of Bhadon (17th August), and it is possible that fever did set in then, but there is every reason to believe that the severer type of fever, which has proved in many instances so fatal, did not get hold of the people with force until towards the close of September.

5. The present report embraces the circumstances of three months, from 17th August to 15th November.

As far as can be learnt, the mortality for the first month, 17th August to 15th September, was far less than in the month running from 16th September to 15th October, and I have good reason to believe that the most fatal time was during the month of October. The disease appears after then to have worn itself, and the deaths which occurred in the first fortnight of November were among those who had held up for long against the attacks, but had not strength to pull through. Many, by the first week in November, had recovered and were gaining strength.

6. I have thought it better to keep the figures of this report to 15th November, as I have been able to secure as complete information as is possible up to that date, and as Mr. Rose, Assistant Magistrate in charge of the Pergunnah, after fully testing all the village returns up to that date, had to proceed on other duty, it is possible that errors may creep into later information, which have been cleared out of the papers now before me.

7. I append to this report a letter drawn up at my request by Dr. Collison, Civil Surgeon and Sanitary Officer. A copy of that letter has, I believe, been sent direct to Dr. Planck by Dr. Collison; I shall have hereafter to refer to Dr. Collison's letter, as there are points which are open to criticism.

The history of the fever has not been treated so fully as might be wished for by the Sanitary Officer.

8. To return to the fever. The disease, as stated above, is believed to have first appeared in an ordinary or mild form

during the last fortnight in August, during September it continued showing some increase in severity towards the end of that month, and during October it appears to have reached its worst point, and to have taken a turn early in November, and to have gradually died out by the close of that month, leaving of course certain effects behind it in the debility of those who have recovered, and in affections of the spleen and diarrhœa and dysentery, which complaints were prevalent during all November, and up to the close of last month.

9. The disease is stated by Dr. Collison (paras. 4 and 5) to be "endemic intermittent fever."

10. As regards the mortality, the figures which I have secured are in some cases appalling. The return of deaths has been taken as carefully as can be, and Mr. Rose and the Tehseeldar have made close local enquiry into the figures, and have ascertained that as little doubt need be placed in the returns as can be wished. There is, however, this point to be remembered, that it is probable that several deaths entered against the fever during the three months (17th August to 15th November) may be those of persons who had died at any time within (say) six months previous to October and November (when the census was taken), and it is possible that in the cases of infants and young children, the number of deaths is exaggerated. In the cases of adults we have the names to depend on, which is not the case with the young children, and it is possible that in enumerating the past deaths of a household, the nephew, son, and grandson of several grown-up members may appear as three children instead of as one child. I am however assured by Mr. Rose that the mortality among infants has been terrible, and from what I saw myself I do not see cause to question the figures in any material degree.

11. There are 79 villages which form the subject of this report.

The total population is taken from the last census (1865), and this amounts to 32,747. It is likely that the population

at the beginning of Bhadon was somewhat in excess of this number, but I had no alternative but to take the last census figures as the basis of investigation.

The total number of deaths entered in the lists for three months, from 17th August to 15th November, amounts to 4,661, giving on the three months the terrible percentage of 14·23.

Of the 4,661 there are recorded 997 men, 1,174 women, (adults 2,171), and 2,490 children (boys and girls under 12).

12. I have divided the villages in 3 classes :—1st, those having under 10 per cent. of deaths ; 2nd, those from 10 to 20 per cent. of deaths ; 3rd, those above 20 per cent., as follows :— *1st*,—There are 21 villages having population 9,312, and deaths 713, with percentage of 7·65 ; *2nd*, there are 44 villages having population 18,643, and deaths 2,709, with percentage of 14·52 ; *3rd*, there are 14 villages, having population 4,792, and deaths 1,239, with percentage of 25·81.

The lowest percentage in any one village is 4 on a population of 202, and the highest is 36 on a population of 443. This last is Futtehpore Atma.

I annex a detail of the 14 worst cases :—

Name of Village.	Population.	Deaths.	Percentage.
Daheylee, ...	341	98	28·7
Hindowlee, ...	450	117	26·0
Futtehpore Serae, ...	505	164	32·4
Khatownee, ...	250	53	21·2
Dogawer, ...	554	112	20·2
Chandwar, ...	186	47	25 2
Futtehpore Atma, ...	443	160	36·1
Hybutpore, ...	502	117	23 3
Bichowlee, ...	243	51	21·0
Chameolee, ...	421	112	26·6
Khanpore Kumbar, ...	278	59	21·2
Neemkheera Bajheera, ...	171	39	22 8
Ghalibpore, ...	79	19	24·0
Lakheempore, ...	369	91	24·6

The 14 villages are situate in the immediate valley or lower slopes of the land on either bank of the river, and are under the full influence of the worst causes of the disease.

13. I now come to the probable causes of the rise and virulence of the fever.

Fever of the usual types is very general in all river valleys from August to November, varying in virulence, duration, and extent, according to the general healthiness or unhealthiness of the season. It is happily only after long terms of normal state of health that visitations, such as the one now reported on, appear, and the present severe attack appeared at a time when the people were probably more prone to suffer than heretofore.

14. In 1870 rains the Sote river rose high, and several floods passed down heavier than those of many former years. The floods were not of very long duration, but they stayed longer than ordinary floods, and covered an unusually extensive area. It is more than probable that the floods of 1870 materially affected the spring-levels. The water-level had been stationary from successive seasons of ordinary rains interspersed with some of drought, until the floods of 1870 came. These must have held up the water for a length of time, percolation of an unusual character must have taken place, and the water-supply must have been ill affected. Added to this a large area was covered with water which had lain uncovered for some years, and the retiring water left a track of land which for some weeks at any rate must have been malarious.

15. These things, I cannot but believe, during 1870 and early in 1871, must have had an ill-effect on the general health and strength of the people in the neighbourhood, and this unusual state of affairs was brought to a head by the very heavy and long-sustained floods of the last rains (1871). Unlike the floods of 1870, the floods of 1871 were of extremely long duration. Instead of days the waters were held up for weeks to an unusual height, and the same ill-effects, which in 1870 must have to some extent resulted, were in 1871 aggravated to an extreme degree. This, as I believe, occurred when the people

were in a state not so healthy as usual, and therefore more ready to suffer severely from the attacks of fever.

16. In all places where the water-supply is affected by heavy floods—that is, where the spring-levels are affected, or where the consistence of the water undergoes a change, the water drinkers all, more or less, feel the effects of the change, and, as must have been the case in the Sote Valley during the entire length of the heavy rains from June to August, 1871, (inclusive)—the water-supply must have been unwholesome. The water in the wells rose, the long-sustained floods must have deranged the consistence of the water from peculiar percolations, and the people were then more than ever prepared for any disease which might set in.

17. As the rains lessened the waters went down. About that time (end of August or beginning of September) the severer type of fever set in. The lands up to then lying under floods now began to emit unwholesome odours, and that part of the country became subject to the same influences as the Terai.

The people appear to have taken some time in becoming universally poisoned by the atmosphere, but in the course of a few weeks the whole river side was under the disease, and it was not till one in seven had died that the state of the village health became improved.

18. There is nothing new in this belief from my own knowledge of the jungles of the Eastern Doon and the river valleys in Saharunpore and elsewhere. I am convinced that the late state of the Sote Valley is an instance of what is found so constant of late years in certain districts in the Meerut Division, and is always present for half every year in Terai and other swampy jungles.

There was precisely the same sickness in certain villages in the Ganges Valley in 1870—not so fatal it is true, but the causes appear exactly the same, with this advantage in favour of the Ganges Valley, that the malarious effects on the sandy soil near

the Ganges were of less duration than along the banks of the Sote.

19. I have now to refer to a few of Dr. Collison's observations. The Sanitary Officer has not entered very deeply into the subject in a professional way. In his para. 4 the Sanitary Officer writes that the fever is "endemic intermittent, much aggravated by want of ordinary sanitary measures." In para. 5, Dr. Collison repeats this view, stating that the fever "although endemic is greatly aggravated by the filthy condition of the wells and their surroundings."

In para. 6, Dr. Collison remarks that "so long as the people drank water from the river, they remained in comparatively good health, but as soon as the river receded too far from the village, they drank their well water, and into this water nearly all the sewage of the village had been washed during the rainy season."

In para. 7 Dr. Collison cites Ramnuggur as proving this.

20. I regret to have to differ to some degree with the Sanitary Officer. The fever is doubtless endemic, but its form or type of severity is, I believe, far more the result of the causes which I have noted than of the causes set down by Dr. Collison.

Doubtless the villages affected, as well as many more not affected, were during the rains and at their close in a dirty state.

All khadir villages in wet weather are dirty; nothing short of metal roads, brick-drains, and air-proof cesspools, could render the sanitary condition of khadir villages in the rains all that could be wished.

In that season the refuse, straw, and cattle manure, are heaped in the usual "dunghills" adjacent to and in some cases far too near the sites. This under a heavy rain becomes "muck," and is of course to some extent offensive, but not particularly bad. No doubt but that the refuse and manure, which in an ordinary year would have found its way to the fields

lay stored for long in the village dunghills, possibly because much of the cultivable land was under water, and certainly because so many hands were down with fever when the waters subsided.

21. I do not believe that any village sewage was washed into the wells. It is certain that no river-flood covered the well mouths; doubtless whatever sewage or filth was left standing on the surface of the soil when the rains fell, and water overflowed during the rains, helped to add evil to the influences already at work in the water-supply from the floods; but as far as I can learn, the circumstances of the wells in the villages under report were not different from those of any other 79 villages taken at random from any khadir lands in any district in Rohilkhund.

22. All wells, with their mouths level with the surface of the soil, cannot but receive many impurities, but to account for the difference of mortality from say 10 in 1,000 (normal) to 140 in a thousand from the cause of impurities washed into the wells is, to my belief, entirely erroneous. I admit and have stated all along that the well water was materially affected by the floods, and in many cases became unwholesome, but its evil quality was but in a very minute degree affected by the washing in of sewage and filth.

In many of the villages many of the wells were on high mounds, with no sewage or filth anywhere near to get into the water.

23. I believe that between the two supplies, the river water may have in some cases been better to drink than the well water; but the Sanitary Officer is in error about Ramnuggur (in his para. 7)—Ramnuggur suffered much. Deaths occurred to the number of 29 in 159 population, equal to 18·2 per cent., considerably above the average of the 79 villages. I am sure that the river water in flood was not wholesome, nor could the ponds under floods contain a wholesome supply of water. It is, however, possible that the well water may have been

worse than either, but far more so from the usual flood causes than from any local impurities being washed into the wells.

Moreover, the fever in some of the cases under report was severe where the well water was taken from properly protected wells, and the water declared by the people, and in one or two instances to my taste found, to be excellent.

24. As reported in my letter No. 125, dated 9th November, 1871, Mr. Rose, Assistant Magistrate, was deputed to attend closely to the relief of the sufferers. Dr. Collison visited the locality for the 3 last days of October, and again from 8th to 18th November. Dr. Collison, accompanied by Mr Rose, visited many villages, and generally reported the result of his enquiries to be the same in all.

All the medical assistance which could be secured was turned to the Sote Valley.

The affected locality was divided into 5 circles, each with a medical practitioner attached,—*i.e.*, 3 with hospital assistants and two with hakeems. The ordinary fever remedies were applied, and so long as the tract of country required attendance, it was served. The people themselves were for long in a desponding condition. Now that the atmosphere is clear of the fever, and the presence of sickness and death has vanished, the people have returned to their normal state.

25. Measures have been in force to clear up all the villages, and steps are being taken to have the wells repaired and improved; very many of the wells are in a very bad state of repair; some have fallen in, and others require patching up, while a large number will have the parapets at their mouths raised.

26. The village people naturally look entirely to the "Sirkar" to do everything for them, and so long as they were in a wretched helpless condition help was given. The non-resident landowners need no compassion, even men whose interests are much tied up in the lives of the cultivators were callous to a degree to the sufferings of the poor.

27. As sanctioned by Government, I have used the sum of money, Rs. 1,000, in the purchase of medicines and in emergent sanitary measures. An account of this expenditure will shortly be submitted.

28. It would be very desirable to secure the permanent location of some Native doctors by the establishment of Branch Dispensaries in towns.

There is one Dispensary at Billaree and another at Chundousee. I believe I shall shortly succeed in securing the necessary subscriptions in Amroha, and have some hopes in Sumbhul.

I think the permanent establishment of the Sudder Dispensary might be strengthened, and this matter will be brought up on an early opportunity.

29. Mr. Rose has done his work in the Sote Valley with considerable care and intelligence; without his constant presence and attention, the distribution of medical relief would have been but of little effect.

2.—*From* C. A. ELLIOTT, ESQ., *Officiating Secretary to the Government of the North-Western Provinces, to* W. A. FORBES, ESQ., C.B., *Officiating Commissioner of the 3rd or Rohilkhund Division (No. 9A.).—Dated Camp, Cawnpore, the 22nd February*, 1872.

I AM directed to request that you will convey the thanks of His Honor the Lieutenant-Governor to Mr. Daniell, the Magistrate of Moradabad, for his full and careful report on the fever which prevailed recently in the Sote Valley in Pergunnah Sumbhul of that District, and also to Mr. Rose, the Assistant Magistrate, for his exertions in relieving the sick.

2. The report will be sent to the Sanitary Commissioner for any remarks which he may have to make, and will eventually be printed in the Selections of Government papers.

Art. XI.

MEMORANDUM ON CERTAIN WORKS RECEIVED FROM PERSIA:

1.—*By* M. KEMPSON, ESQ., *Director of Public Instruction, N. W. P., No.* 168, *dated 8th February*, 1872.

1. A collection of the writings of Qáani, Faroghi, and Jalal, edited by the latter, with marginal notes.

1. *Diwan-i-Qáani.*—The author was known as Hakim Qáani Habib-ullah, son of Mirza Abul Hassan, called Gulshan among the poets. He was brought up in Khorásan, and, on account of his great abilities, was honoured with the friendship and patronage of Prince Hassan Ali Mirza, and being afterwards invited to the Court of Futteh Ali Shah, obtained the first rank among the *literati* of his day. His accomplishments in all branches of Oriental learning were unrivalled, and his poetical ability was conspicuous in the Arabic, Turkish, and Persian languages. He was renowned for facility and elegance of expression in all forms of poetical composition, and the odes and other pieces in this collection, containing 20,000 verses, attest his merits. He outlived his patron, but received equal honour under the succeeding Shah (Nasir-ud-deen). He died 1270 A. H.

2. The second poet, whose writings find a place in this collection, was a contemporary of the former, by name Mirza Abbas, son of Aqa Musa—an inhabitant of Turkistan. His poetical title was originally Miskin, afterwards Faroghi. He was held in honour at the Court of Persia, but lost his nose for offending one of the nobles. The specimens of his composition given are chiefly Ghazals and Qasidahs. He died in 1274 A. H.

3. Jalal is the poetical title of Prince Jalál-ud-deen Mirza, born in 1245 A. H. Thirty specimens of his composition are given at the end of the collection, and the notes are due to him as editor.

2. *Hadaiq-us-sahr.*—This is a prose work on rhetoric by Khwaja Imam Rashid-ud-din, who flourished much about the same time as the poetical authors named in the foregoing paragraph. It seems probable that the work is a translation from the Arabic from the frequency of references to that language for examples.

3. *Hadiq Sah Sanai.*—This is a work of great celebrity, composed about the year 500 A. H. by Abal Majd *alias* Hakím Sanai, so called from the name of his birth-place or residence. He was attached to the Court of Amin-ud-dowla Bahram Shah of Ghazni. He was of the Sufi School, and his work treats of moral and intellectual topics, with memoirs of his time, and praises of Bahram Shah and his courtiers. His style and diction are considered models of good taste, and he is referred to by the moderns as an authority.

4. *Ganjinah-i-nishát.*—The author of this work was Mirza Abdul Wahab, whose poetical title was Nishát. He flourished in the time of Futteh Ali Shah, and his writings, both prose and poetry, are highly esteemed in Persia. The work under notice is divided into five sections:—

The first section explains the principles of Sufeeism.

The second consists of addresses, and of poetical pieces, complimentary and descriptive.

The third contains specimens of royal orders and regulations, and is historical in character.

The fourth is a collection of petitions addressed to royalty.

The fifth is poetical entirely.

The 2nd, 3rd, and 4th sections are the most valuable in a literary point of view.

5. No. 3 of the above works is known in India. The others need only to be introduced to be appreciated. Persian literature in this country seems to have received no accessions of value from abroad since the establishment of the Musalman sovereignty on a basis independent of relations with Persia and the sovereignties south of the Caspian—that is, since the time of Akbar, 300 years ago. Between the times of Mahomed and Akbar, the literature of Persia passed on to India, because the intercourse between the countries was generally uninterrupted, but the Mahomedan sovereigns of India of this period were illiterate ignorant men, as a rule, and there was little actual literary progress in the latter country so far as poetical authorship is concerned. Amir Khusru, a Persian poet at the Court of Balban (A. D. 1266-86), wrote Persian, but he set the example of writing Urdú verses also, and a race of Urdú poets gradually arose. Persian poetry was written by his poetical successors in India, but their compositions found comparatively few readers, and reached no special degree of excellence. Much the same may be said as regards Persian prose. It is difficult to name any good prose work which has currency in India, except the Anwar-i-Sóheili, which is an adaptation of Hindú genius dating back to the reign of Nousherwan. Firdusi and Nizami wrote their annals in verse, but the prose historians of India wrote bad Persian. So too Abul Fazl, whose letters are verbose and affected. Hence the introduction in India of modern Persian works of repute should give an interest and a stimulus to the study of the language which it has long wanted. I have already ventured to recommend the books which form the subject of this note to the Calcutta University Syndicate for a place in their F. A. and B. A. Courses in the Persian language. This is of course tantamount to introducing them in the schools and colleges of this Province, but selection and careful editing are necessary; and as our Native scholars are equal to the task, I wish for His Honor's permission to use the books now returned for this purpose.

2.—*From* C. A. ELLIOTT, ESQ., *Officiating Secretary to the Government of the North-Western Provinces, to* M. KEMPSON, ESQ., M.A., *Director of Public Instruction, North-Western Provinces* (*No.* 1007).—*Dated Allahabad, the* 26*th of March*, 1872.

IN reply to your Memo. No. 168, dated 8th February, reviewing the Persian works noted on the margin, which were received from Her Majesty's Minister at the Court of Persia, I am directed to say that His Honor the Lieutenant-Governor quite concurs in your estimate of the merits of the books, and does not doubt that the works, when well-edited and printed, will be very acceptable to the Persian reading part of the community of these Provinces.

Divan-i-Qáani.
Farûghi-o-Jalâl.
Hadaik-us-Sahr:
Hadiquah-i-Sanai.
Ganjinah-i-Nishat.

2. The books are herewith returned for revision and careful editing in the manner suggested by you, and I am to request that when done with, they may be lodged in the Allahabad Public Library.

3. Your Memo. and these orders will be printed in the next volume of "Selections from Government Records."

Art. XII.

TWO SCIENTIFIC TREATISES IN URDU.

MEMO. No. 8 OF 1872.

1.—*A Treatise on Astronomy*: *By Moulvie Samsam-ul-Haq, Sheikhpoora.*

THIS tract is a statement (1) of the system of Ptolemy adopted by the Arabs, and still believed in (2) of the system of Pythagoras revived by Copernicus.

The explanation of the first system occupies 31 pages, and the writer introduces the second, with the remark that Mahomedans understood the first to have the sanction of the Koran, and therefore refuse to accept the second, albeit the truer system, which makes the sun the centre of the universe, and the earth a planet revolving on its own axis round the sun. He combats this idea as folly, and says that the more rational system should be accepted, for the Koran cannot imply what is untrue or irrational. Consequently the second part of the work explains the Copernican system, and brings reasons for its correctness. Kepler and Newton's refinements of the system are mentioned, and the work concludes with the statement that Mahomedan Philosophers were not ignorant of the theory (page 55), and he quotes the work of one who argued against it, partly in proof of his statement, and partly to show that the objections raised are futile. The work is not by any means scientific. There are no calculations, and only the barest outlines of the systems are given, but it is interesting in the same way as the corresponding part of Moulvie Obyd-ullah's book is interesting—namely, as a yielding of Mahomedan prejudice before Western science.

In both tracts Pythagoras and not Copernicus gets the credit—a point not without its significance. I think a complimentary note, with a present of Rs. 100, will please the writer and his friends.

MEMO. No. 9 OF 1872-73.

2.—*Dabistán-i-Dánish Amoz—Urdú printed book of* 68 *pages, small Octavo: by Moulvie Obydullah-ul-Obydi, Hooghly College.*

THIS is an elementary work on the phenomena of the earth and the heavens, compiled from various sources—Arabic and English. It is less elementary than our *Vidyankur* or *Haqaiq-ul-Moujúdát*, and merits approval so far as the subject-matter is concerned. The first two sections are useful in the way of supplying the Arabic terms for matter and its relations according to the Oriental school. The third section treats of the form of the earth and its movements, and is apparently borrowed from Mann's Lessons in general knowledge. The next four sections describe clouds and rain, dew, snow, thunder, lightning, the rain-bow, earthquakes, &c., concluding with a reference from the Koran to the terrors of the Almighty. The 8th section describes the system of Ptolemy known as *Nizam-i-bat-lí-músi*, which made the earth the centre of the universe, and which still holds good in the east, and compares it with the system of Pythagoras, afterwards elaborated by Copernicus, and called *Nizam-i-Shamsi* for obvious reasons. The 9th and 10th sections explain eclipses and the moon's motion, and the 11th returns to the old and new system of Ptolemy and Copernicus, with statement of arguments in proof of the truth of the latter. The 12th section answers objections raised to the motions of the earth. The 13th treats of the animal, mineral, and vegetable kingdoms, and the five senses, and the 14th of the organs of speech, and the reasoning faculties, and the last section treats of vegetable, animal, and human life.

Altogether it is a useful little book, and is intended apparently to be the first of a series. I welcome it as a sign of the unbending of the Mahomedan intellect in favour of modern science; for a Moulvie has a good deal to give up before he can accept the statements of even our juvenile books of science. The author, like others of the class, is so peculiarly touchy, that I hesitate to say that his Urdú is incorrect, which it certainly is, lest my

remark become the nucleus of a correspondence with the Bengal Government perhaps, as on a former occasion. A list of mistakes sent in confirmation afterwards was a sufficient answer, for nothing more was said, but it is unpleasant to be involved in a discussion of the kind. Perhaps the best way would be to offer a reward of Rs. 100 to the author in compliment for the intelligent way in which he has treated his subject.

3.—*Extract, paras.* 1, 3, *and* 5, *of letter No.* 1624*A. of* 1872, *dated Allahabad, the 3rd of May,* 1872, *from the Secretary to the Government of the North-Western Provinces, to the Director of Public Instruction of the North-Western Provinces.*

1. I AM directed to acknowledge the receipt of your letter No. 284, dated the 22nd April last, with which you submit memoranda containing your opinion on certain Vernacular works received under the Prize Notification.

3. As recommended, the Lieutenant-Governor sanctions a reward of Rs. 100 to Moulvie Samsam-ul-Haq, author of the Treatise on Astronomy, which may, as proposed, be presented with a complimentary note. Your review of the work will be published in the "Selections" from the Records of this Government.

5. The payment of a reward of Rs. 100 is sanctioned to Moulvie Obydullah-ul-Obydi, author of the work Dabistan-i-Danish Amoz. With reference to your remarks in the concluding paragraph of the Memorandum, I am to observe that there is no doubt that the Urdu idiom current in Lower Bengal is regarded as uncouth and inelegant at the centres of Hindustani literature, and the statement of the fact, though it may not be pleasant, ought not to offend. Your Memorandum will be published in the "Selections from the Records of Government."

Art. XIII.

MERITORIOUS BOOKS BY NATIVE AUTHORS.

SILSILAT-UL-ULUM :—*A Series of 23 volumes of Mathematical Works in Urdu, Lithographed, 8 Vols.: by* MOONSHEE ZAKAOOLLAH, *Head-master, Government Normal School, Delhi. Memo. No.* 10, *dated Allahabad, the 3rd May,* 1872.

LIST OF THE BOOKS.

Mathematics (pure.)

No.	NAMES OF BOOKS.	8vo.	No.	NAMES OF BOOKS.	8vo.
1	Todhunter's Euclid, ...	440 Pages.	11	A Treatise on the Differential Calculus by ditto, ...	372 Pages.
2	Todhunter's Algebra for Beginners, ...	304 ,,	12	Barnard Smith's Arithmetic, ...	488 ,,
3	Todhunter's Trigonometry for ditto, ...	206 ,,	13	Ditto Algebra, ...	413 ,,
4	Todhunter's Mensuration,	284 ,,	14	Manual of Arithmetic, by S. Haughton, ...	184 ,,
5	Todhunter's Algebra for Colleges and Schools, ...	552 ,,	15	Manual of Plane Trigonometry by Galbraith and Haughton, ...	106 ,,
6	Todhunter's Plane Trigonometry, ...	193 ,,			
7	Todhunter's Spherical do.,	124 ,,	16	Manual of Algebra by S. Haughton, ...	210 ,,
8	An Elementary Treatise on the Theory of Equations, by Todhunter, ..	292 ,,	17	Manual of Euclid by ditto,	198 ,,
			18	Trigonometry by Willmot,	104 ,,
9	Plane Co-ordinate Geometry as applied to the straight Line and the Conic Sections, by Todhunter, ...	288 ,,	19	1st Part Arithmetic (Hind's.) ...	222 ,,
			20	4th ditto ditto ditto,	52 ,,
			21	Mensuration by Hunter,...	106 ,,
			22	Euclid by Potts, 2 volumes	484 ,,
*10	A Treatis on the Integral Calculus, by Todhunter,		23	Deductions from Euclid, 2 volumes (Potts), ...	164 ,, 116 ,,

I have had each treatise carefully examined by qualified scholars in the Department, and have myself tested the correctness of terms and mode of explanation adopted in the more difficult subjects of Nos. 7, 8, 9, and 11. All are remarkable for careful and exact rendering. They are free from inelegancies of speech, and the technical terms employed are those commonly received. The figures are drawn correctly, indeed remarkably so, considering that they are lithographed. The translator is perhaps happier in his treatment of Geometry and Trigonometry than any other subjects. Four of the volumes are translations of different editions of Euclid, of which Mr. Potts' edition, with a magnificent collection of problems, is the most copious, and has evidently cost the translator much time and trouble. He has adopted that editor's system of placing the step of the demonstration in paragraphs, for clearness sake, without the use of symbols.

* Not yet ready for publication.

There are four treatises on plane and one on spherical Trigonometry, the latter a translation of the best work on the subject—Mr. Todhunter's. Among the former is a translation of Mr. Willmot's Trigonometry, published in this country, for the use of Native students, and marked by the clearness with which it unfolds the introductory notions of the subject. This work has the additional advantage of including examples taken from the examination papers of the Calcutta University. The treatises on Algebra and Arithmetic are well chosen for translation. Mr. Barnard Smith's Arithmetic is rather bulky and voluminous for a school book, but the methods and rules are admirable; and Munshi Zaka-oollah seems to neglect nothing in his version. Todhunter's Algebra is the standard work of its kind now out, and the more difficult chapters on "Negative quantities," "Anomalous forms," and "Imaginary expressions," in the earlier part of the book, are well given by the translator. This is an important point, for the great merit of Mr. Todhunter's works is their lucid language, and the careful way in which difficulties are anticipated. The tract on the Theory of Equations is a sequel to the Algebra. The treatises on the Differential and Integral Calculus by the same author have also become standard works, and Munshi Zaka-oollah has been well advised in selecting them for translation. The smaller school manuals by Galbraith and Haughton, of the Queen's College in Ireland, are intended for younger students. They have presented no difficulty to the translator.

2. The appearance of a series of mathematical works in Urdu just at this time is a welcome support to the argument for teaching science in the vernacular, and I can only say that I want no better books for a thorough course of pure mathematics than those now under review.

Let the subjects be taught in this medium, and we shall not long have to complain of parrot-like repetition and want of thought among our under-graduates. The course contained in the *Silsilat-ul-ulum* is sufficient to carry the student up to the B. A. standard, with the addition of simple mechanics and hydrostatics.

3. Moonshee Zaka-oollah was originally brought up in the Delhi College under this Government, and became a Deputy Inspector of Schools. He was afterwards transferred to his present appointment at Delhi at Major Fuller's request. I think the highest degree of credit attaches to the honest and careful completion of the task he has undertaken. The labour has been very great, and no small amount of mathematical talent appears in the style and quality of the work. It bears the character of a scientific rather than a literary performance, but as an important aid to education, comes, I think, well within the scope of His Honor's Notification.

I should recommend the highest reward of Rs. 1,000, and would even go further and suggest that an extra prize of Rs. 500 be added.

2.—*From* THE SECRETARY TO GOVERNMENT, *North-Western Provinces, to* THE DIRECTOR OF PUBLIC INSTRUCTION, *North-Western Provinces, No.* 2161*A.*, *dated Nynee Tal, the* 15*th June*, 1872.

I am directed to acknowledge the receipt of your letter No. 415, dated 3rd May, 1872, enclosing a memorandum on the series of mathematical works prepared by Moonshee Zaka-oollah, Head-master of the Government Normal School, Delhi, under the Prize Notification, and to say that His Honor the Lieutenant-Governor has received your report on the merits of the works with great satisfaction.

2. This Government is much indebted to its old employé, Moonshee Zaka-oollah, for the industry displayed in the preparation of this excellent series of scientific works, and for his public spirit in publishing them, and has much pleasure in assigning the full reward of Rs. 1,000 from this year's grant, and also Rs. 500 from the unexpended balance of last year's grant, in recognition of the services he has rendered.

3. Your memorandum and these orders will be published in the Supplement to the North-Western Provinces *Gazette* and in *Selections*.

Art. XIV.

REPORT ON THE ACTUAL OUTTURN OF COTTON IN THE NORTH-WESTERN PROVINCES FOR THE YEAR 1871-72.

1.—*From the* SECRETARY TO THE BOARD OF REVENUE, *North-Western Provinces, to the* SECRETARY TO GOVERNMENT, *North-Western Provinces* (*No.* 389).—*Dated Allahabad, the 19th April,* 1872.

I AM directed to forward, for the information of His Honor the Lieutenant-Governor, a report on the actual outturn of cotton for the year 1871-72.

2. On reference to the accompanying comparative statement, it will be observed that the actuals for the districts of Mirzapore, Ghazeepore, and Benares have not been given, because, as noted in the column of remarks, the crop in those districts has not yet been gathered.

3. The *estimated* acreage and outturn for the three above-mentioned districts have been included in the totals given below, as the actuals, it may be assumed, will be about equal to the estimate, and, under any circumstances, the aggregate results will scarcely show any appreciable difference, Benares not being a cotton-growing division.

4. An abstract of the reports received from Collectors will be found embodied in the general statement.

5. As the Board have already fully reported on the estimate, they limit their present report to a brief summary of the actual results.

6. The actual area under cotton during the year 1871-72 was 1,072,479 acres, against an estimate of 1,064,622 acres, being an increase of 7,857 acres.

7. The outturn of the Province was estimsted at 818,846 maunds of cleaned cotton, or an average of 30 seers 12 chittacks per acre, and the actual outturn has been, 822,425 maunds, that is, 3,579 maunds in excess, or an average of 30 seers 10 chittacks per acre.

8. From the above it would seem that the difference between the actuals and the estimate is very small, but if the divisions are taken separately, this is not always the case. For instance, in the Agra Division, the estimate was 305,738 maunds, and the actuals are 363,139 maunds, or an excess of 57,401 maunds; whereas in Allahabad the estimate was 100,931 maunds, and the actuals are 69,961 maunds, or a decrease of 30,970 maunds. In the latter division excessive rain has been the cause of the falling-off. The difference in the other divisions is not so marked.

9. The Board, in paragraph 6 of their report on the estimate, brought to notice the difference that existed in the average outturn of certain districts. By the following statement of the actual outturn of all the divisions the variation in the produce is again very peculiar, *viz.*, from 1 maund, 10 seers, and 2 chittacks in the Meerut Division, to 10 seers 15 chittacks in Allahabad :—

	M.	S.	C.
Meerut, ...	1	10	2
Kumaon, ...	0	25	3
Rohilkhund, ...	0	24	8
Agra, ...	0	36	11
Jhansie, ...	0	15	15
Allahabad, ...	0	10	15
Benares, ...	0	20	8

10. The outturn for the year under report, although considerably less than it was last year, is in excess of the three preceding years, *viz.* :—

1867-68, ...	5,78,75,120	lbs.
1868-69, ...	4,41,37,840	„
1869-70, ...	3,71,04,160	„
1870-71, ...	7,63,87,600	„
1871-72, ...	6,57,94,000	„

11. A list of prices since the last report was submitted has not been furnished by Collectors. The following, in continuation of the price list forwarded with the estimates, is taken from the *Government Gazette* for the months of January, February, and March, 1872.

Division.	Districts.	Price of cleaned cotton per rupee.		
		January.	February.	March.
		lbs. oz.	lbs. oz.	lbs. oz.
Meerut, ...	Dehra Doon, ...	5 8	4 12	5 10
	Saharunpore, ...	6 0	5 4	5 0
	Moozuffernuuggur, ...	...	5 8	5 8
	Meerut, ...	5 4	5 0	5 0
	Boolundshuhur, ...	5 12	5 0	5 0
	Allygurh, ...	5 0	5 0	5 5
Kumaon, ...	Kumaon, ...	3 1	2 8	2 8
	Gurhwal, ...	4 0	...	2 8
Rohilkhund,	Bijnour, ...	5 11	5 1	4 10
	Moradabad, ...	4 11	4 6	4 2
	Budaon, ...	4 13	4 2	4 4
	Bareilly, ...	4 7	4 4	4 6
	Shahjehanpore ...	4 0	...	4 0
	Terai Pergunnahs, ...	4 6	4 6	3 12
Agra, ...	Muttra, ...	5 7	4 14	5 4
	Agra, ...	5 0	5 0	5 0
	Furruckabad, ...	5 8	5 8	...
	Mynpooiy, ...	5 5	4 3	4 6
	Etawah, ...	5 5	4 4	4 7
	Etah, ...	5 0	5 0	5 0
Jhansie, ...	Jaloun, ...	4 8	4 0	4 0
	Jhansie, ...	4 9	4 2	4 0
	Lullutpore, ...	...	4 0	4 0
Allahabad,	Cawnpore, ...	3 13	3 13	3 13
	Futtehpore, ...	5 0	4 0	4 0
	Banda, ...	5 4	4 13	4 7
	Allahabad, ...	4 0	4 0	4 0
	Humeerpore, ...	5 2	...	5 0
	Jounpore, ...	4 0	4 0	4 0
Benares, ...	Goruckpore, ...	3 10	3 10	3 10
	Bustee, ...	4 7	3 12	3 12
	Azimgurh, ...	3 13	3 13	3 13
	Mirzapore, ...	4 2	4 2	4 4
	Benares, ...	4 0	4 0	4 0
	Ghazeepore, ...	4 6	4 6	4 6

12. A copy of this report has been forwarded direct to the Chamber of Commerce.

2.—*From the* SECRETARY TO GOVERNMENT, *North-Western Provinces, to the* SECRETARY TO THE BOARD OF REVENUE, *North-Western Provinces* (*No.* 738 *A.*)—*Dated Allahabad, the* 21*st May*, 1872.

I AM directed to acknowledge receipt of your letter No. 389, dated the 19th April, with which the Board submit a report on the actual outturn of cotton in the North-Western Provinces for the year 1871-72.

2. The general results for the year under review stand as follows;—

ESTIMATES.		ACTUALS.	
Area.	*Outturn.*	*Area.*	*Outturn.*
Acres.	Maunds.	Acres.	Maunds.
1,064,622	818,846	1,072,479	822,425

That the actuals agree so closely with the estimates is due to the fact that the estimates in some cases were only submitted after the actuals were known. On the whole, it is generally admitted that the crop was poor, the heavy and continued rains having done much injury to the plant.

3. Compared with the actuals of 1870-71, the figures for the several divisions stand thus :—

	1870-71.		1871-72.	
	Area in Acres.	Outturn in maunds.	Area in Acres.	Outturn in maunds.
Meerut, ...	236,036	320,737	224,984	281,986
Kumaon, ...	5,995	3,916	2,548	1,605
Rohilkhund, ...	176,262	106,048	133,437	81,735
Agra, ...	391,381	362,006	395,676	363,193
Jhansie, ...	87,371	28,535	41,964	16,719
Allahabad, ...	322,014	122,605	255,722	69,961
Benares, ...	29,247	10,998	5,257	672
Total, ...	1,248,306	954,845	1,072,479*	822,425*

These figures show that, with the exception of the Agra Division, there was a universal falling-off in both the area and outturn of 1871-72, as compared with 1870-71. The comparatively low prices ruling in the producing districts in the

* Including the estimates of three districts of the Benares Division, omitted from Divisional total.

months of May and June tended no doubt to diminish the area sown with cotton.

4. It appears that in the Districts of Benares, Mirzapore, and Ghazeepore, a peculiar kind of cotton is grown called "munowa," which is sewn in June or July, and ripens in April. This fact has never been clearly brought out in previous reports, and it will be of some interest to enquire what the difference between the two species is, and whether the fibre of the munowa is distinguishable from that of the common North-West cotton. The attention of the Cotton Commissioner will be drawn to this point. The amount, however, which is produced in the Benares Division is insignificant.

5. Both in your present letter and in that which forwarded the report on the estimate of the year, the Board have commented on the discrepancies between the produce rate in different districts. These discrepancies are very great, and throw doubt on the accuracy of the calculation. The Board's remarks should be communicated to the Collectors of the different districts, who will try either to reconcile their figures with those of their neighbours, or to explain the causes of difference. It is not reasonable to suppose that there can be a great difference in the average outturn of cotton per acre between two adjoining districts, provided they are similar in their soil and system of cultivation.

6. But there is another method by which the return of produce may be roughly tested, and to which His Honor would direct the attention of the Board. It is to frame a rough estimate of the necessary local consumption and to compare it with the calculated outturn. The estimate of consumption per head was placed by Luchmun Singh, Deputy Collector, at 2lbs. per head; and this, though undoubtedly low, may be accepted as a tolerable approximation to the truth. At this rate, the consumption of the North-Western Provinces is 60,000,000lbs., and an outturn of 65,794,000lbs. leaves only 5,794,000lbs., or 72,425 maunds, or 19,300 bales of 300lbs. each for export. No exact statistics of our export trade

exist, but His Honor is under the impression that the true figure is much larger than this. The Cotton Commissioner will be asked if he can supply any information on this head.

7. The table on the margin shows side by side the declared outturn of each district, and the necessary consumption at 2lbs. per head. This could be utilised if we had accurate knowledge as to each district, whether it imports for local consumption or exports after providing for its own wants. In their report of 1869-70, the Board collected much interesting information on this head, but the point now raised was not then exactly met. Cotton imported and re-exported for purposes of trade should be neglected, and the enquiry should be whether the district as a whole raises enough cotton to clothe its own population. The table shows that in Furruckabad, Mynpoory, Jhansie, Banda, Humeerpore, the local outturn does not provide 2lbs. per head for the local population; but, according to the information at present before the Lieutenant-Governor, the opposite is the fact. The Collectors of all districts should be requested to

District.	Actual produce of cotton in 1871 in lbs.	Amount at 2lbs. per head of the population.
1.	2.	3.
Dehra Doon, ...	2,000	205,662
Saharunpore. ...	1,993,289	1,732,966
Moozuffernuggur,	3,069,840	1,364,424
Meerut, ...	5,348,560	2,399,186
Boolundshuhur,...	7,477,[illegible]4[illegible]	1,600,862
Allygurh, ...	4,668,160	1,851,076
Kumaon, ...	20,400	771,580
Gurhwal, ...	...	597,484
Terai, ...	108,000	183,604
Bijnour, ...	1,365,120	1,381,950
Moradabad, ...	3,017,920	2,190,612
Budaon, ...	1,265,600	1,779,620
Bareilly, ...	650,320	2,762 668
Shahj-hanpore,...	239,840	2,033,688
Muttra, ...	13,174,720	1,600,642
Agra, ...	7,966,080	2,057,088
Furruckabad, ...	899,520	1,831,886
Mynpoory, ...	1,222,720	1,400,440
Etawah, ...	2,014,800	1,252,888
Etah, ...	3,773,280	1,228,702
Jaloun, ...	877,200	811,208
Jhansie, ...	426,720	714,384
Lullutpore, ...	33,600	496,292
Cawnpore, ...	2,619,920	2,377,724
Futtehpore, ...	645,440	1,361,572
Banda, ...	1,287,520	1,448,744
Allahabad, ...	433,760	2,786,366
Humeerpore, ...	592,400	1,041,882
Jounpore, ...	17,840	2,030,854
Goruckpore, ...	48,240	3,967,632
Bustee, ..	3,689	2,911,394
Azimgurh, ...	1,840	2,771,744
Total, excluding Districts of Mirzapore, Benares, and Ghazeepore, ...	65,265,360	52,847,324

make especial enquiries on this subject, and to relate the results in their next year's report.

8. The variations in price as shown in paragraph 11 of the Board's report are remarkable. So far as any general deduction can be drawn from the figures submitted, it may be said that the price tends to rise in the lower districts of the province, but many of the variations seem unaccountable, and His Honor would have been glad if the Board had made some attempt to explain and correct them. It is known, for instance, that cotton is carried from Cawnpore *vid* Fyzabad to the north of the Goruckpore District, yet, according to the figures in the Board's report, it sells at Cawnpore at 3lbs. 13 oz., and at Goruckpore at 3lbs. 10 oz. per rupee. There is, therefore, a difference of only 3 oz., which could not cover the cost of carriage. Again, Cawnpore cotton, when carried to Mirzapore, has to be parted with at 4lbs. 2 oz. per rupee, or at a loss of 5 oz., in addition to the cost of carriage, and if taken to Ghazeepore a further loss of 4 oz. would be incurred. These variations may, to some extent, be due to the difference in the unit of weight in different markets, and to other local peculiarities of the trade, or the quotations may represent in some cases wholesale, in other cases retail, prices. Whatever may be the true cause, if the discrepancies noticed can be explained, it should be done, and His Honor indicates these points to the Board as being worthy of consideration and discussion in future reports.

9. In conclusion, I am to say that it is believed that the above points of difficulty can only be satisfactorily overcome by some central authority, and the Lieutenant-Governor considers that, for this purpose, the report might, with advantage, be submitted to Government through the office of the Cotton Commissioner, who would be able to reduce the rates of produce and prices to one common denominator, and otherwise to explain and reconcile existing anomalies. Absolute accuracy cannot, of course, be expected, but His Honor can see no sufficient reason why a rough approximation should not be expected. The Cotton Commissioner will be addressed with a view to this procedure being adopted in future.

Art. XV.

MUNICIPAL FREE SCHOOLS, BENARES.

1.—*From* THE COMMISSIONER OF THE BENARES DIVISION, *to* C. A. ELLIOTT, ESQ., *Secretary to Government, North-Western Provinces, Allahabad, No.* 121, *dated Benares, the* 18*th May*, 1872.

I HAVE the honour to submit, for the information of Government, a report, with tabular statements, relating to the Ragged Schools in the City of Benares supported by the Municipality.

2. I have lately had an opportunity of inspecting several of these schools in company with Baboo Aishwarya Narain Sinha, one of the Sub-Committee, under whose special supervision they are placed, and I have much pleasure in reporting that, though no warning had been given of my intended visit, I found a good attendance of boys, and such an amount of knowledge acquired by some of them as was very satisfactory. The success of the Juggutgunge School is mainly due to the interest taken in it by Mr. Tresham, Head-master of the Normal School, who keeps a constant watch over it.

3. The remaining nine Schools are not so advanced, but there can be no question that they are all doing good service in providing elementary instruction to a class of boys who would otherwise be debarred from it.

2.—*From* THE MAGISTRATE AND PRESIDENT, MUNICIPAL COMMITTEE, *Benares, to* THE COMMISSIONER OF THE BENARES DIVISION, *No.* 9—*Dated Benares, the* 11*th April*, 1872.

I HAVE the honour to submit the information asked for in your docket No. 2, dated 26th January, and No. 5, dated

26th February, regarding the Ragged Schools established by the Benares Municipality.

2. For the erection of the first Ragged School-house, His Highness the Maharajah of Vizianagram contributed the necessary funds, and Mr. Forbes, the Officiating Commissioner, maintained this school at his own expense for some months.

3. The experiment working well, the Municipality were induced to open nine other Ragged Schools at different localities in the city, where they seemed to be much needed. These schools were opened in June, 1871, and from that date the Municipality also took over the original Ragged School referred to in the preceding paragraph.

4. The Municipal Committee, on discussing the propriety of increased grants in behalf of educational purposes, came to the conclusion that it was their first duty to assist the poorer classes of the city in obtaining an elementary education. As observed by His Honor, there are no free *Hulkabundi* Schools in Benares, and although there are many Free Schools supported by private and public subscriptions in the city, yet nearly all of these are Sanskrit or Zenana Schools, and do not meet the want which has been long felt, and which it was the intention of the Municipality, if possible, to supply.

5. These schools are under the immediate supervision of a Sub-Committee, consisting of the Tehseeldar of Benares, Aishwarya Narain Sinha, and Pundit Beni Rao. The Deputy and Sub-Deputy Inspectors also visit these schools.

6. I submit several figured statements showing the castes of the boys attending the schools, the subjects in which instruction is given, the number of boys attending the different classes in each school, and the progress made. A general statement is also submitted showing the total number of pupils attending all the schools, the average daily and monthly

attendance, the subjects studied, with the receipts and disbursements. Another statement gives the names and qualifications of the teachers.

7. It will be seen that boys of 53 different castes attend these schools; of these, 43 castes pertain to the Sudra order, and amongst the latter are some of the lowest castes, such as Mochi, Passi, Chumar, Halalkhore, Pahri, Dhobi, Dhurkar, and Bind. Some boys of the higher castes also attend, but their social position is so low, and they are so poor, that their parents cannot afford to pay for their education.

8. These schools are popular with the people; this is proved by the increasing attendance of pupils. The free Sanskrit Schools are only attended by Brahmins, Sanskrit only being taught; and the ordinary Hindee Schools in the city are not attended by the same class of boys as that attending the Municipal Schools; at the former, tuition fees or certain perquisites are usually collected for the teachers, and the scholars are required to attend the greater portion of the day.

9. The children of the poorer classes cannot afford the time to attend school all day; they are therefore received at the Ragged Schools at any time during school hours, and are permitted to leave as soon as their tasks are completed, receiving a reward of a few *cowries* for every lesson they master.

10. The Juggutgunge School stands first in the list, both as regards attendance and the progress made by the scholars; but in the case of every one of the schools, the result of the experiment is, I think, highly satisfactory, and there is every reason to hope that these Ragged Schools will prove a success, and accomplish no small good, by placing a sound elementary education within the reach of hundreds of our city population, and by helping to break down the caste prejudices entertained by so many regarding the association of the lower with the higher castes.

No. I.

Statement showing classification of Castes of the Boys of the Municipal Ragged Schools, Benares, for the year 1871-72.

No.	Castes.	No. of boys.	No.	Castes.	No. of boys.
1	Brahmin ...	62	28	Bunderwar ...	1
2	Bannia ...	21	29	Chamar ...	26
3	Khettri ...	10	30	Dhobee ...	5
4	Rajpoot ...	29	31	Kandoo ...	11
5	Ahir ...	18	32	Tamolee ...	9
6	Kyasth ...	25	33	Thatthara ...	2
7	Hajjam ...	13	34	Gararіah ...	1
8	Mussulman ...	24	35	Koonjra ...	3
9	Kahar ...	21	36	Halalkhore ...	3
10	Sonar ...	10	37	Paharee ...	1
11	Goswai ...	3	38	Dharkar ...	4
12	Hulwai ...	16	39	Koomhar ...	3
13	Durzee ...	6	40	Kharadi ...	2
14	Koeree ...	46	41	Gond ...	2
15	Nepalee ...	1	42	Bhur ...	5
16	Bengalee ...	3	43	Bhatt ...	2
17	Mochee ...	39	44	Lehara ...	1
18	Mallah, ...	28	45	Dafali ...	1
19	Lohar ...	26	46	Noorbaf ...	1
20	Koonbee ...	27	47	Akarhari ...	15
21	Talee ...	52	48	Kasoundhan ...	2
22	Nooneah ...	29	49	Bind ...	20
23	Kulwar ...	81	50	Rajbhatt ...	1
24	Bhoonja ...	13	51	Bhatiarah ...	1
25	Kuswurani ...	3	52	Christian ...	2
26	Roniar ...	1	53	Bairagee ...	1
27	Passi ...	9			
					740

No. III.

Progress Statement of the Municipal Ragged Schools, Benares, for the year 1871-72.

No.	Schools.	Class.	No. of boys on roll.	Subjects studied.
1	Hoogoolgunj	2	14	Vidyankur, Multiplication.
		3	17	Barnamala, Tables, Balbodh.
		4	43	Letters and Figures.
2	Khajnah ...	2	15	Vidyankur, Multiplication.
		3	21	Barnamala, Tables, Balbodh.
		4	31	Letters and Figures.
3	Machhodari	2	4	Vidyankur, Multiplication.
		3	13	Barnamala, Tables, Balbodh.
		4	46	Letters and Figures.
4	Jalalipore ...	3	4	Barnamala, Tables, Balbodh.
		4	38	Letters and Figures.
5	Rajghat ...	2	2	Vidyankur, Tables and Multiplication.
		3	17	Barnamala, Tables, Balbodh.
		4	37	Letters and Figures.
6	Dassasumede	2	21	Vidyankur, Multiplication.
		3	26	Barnamala, Tables, Balbodh.
		4	35	Letters and Figures.
7	Bhadene ...	2	5	Vidyankur, Multiplication.
		3	15	Barnamala, Tables, Balbodh.
		4	47	Letters and Figures.
8	Ardalibazar	3	28	Barnamala, Tables, Balbodh.
		4	20	Letters and Figures.
9	Jaidpoora ...	2	8	Vidyankur, Multiplication.
		3	7	Barnamala, Tables, Balbodh.
		4	53	Letters and Figures.
10	Jagatgunj ...	1	19	History, Geography, and Arithmetic.
		2	14	Vidyankur, Multiplication.
		3	11	Barnamala, Tables, Balbodh.
		4	129	Letters and Figures.

No. IV.

Statistical Return of the Municipal Ragged Schools, Benares, for the year 1871-72.

Name of Institution.	Locality.	No. of Schools.	When established.	Number of pupils on the roll at the end of the year.					Average daily attendance.	Average monthly attendance.	Number of pupils studying in each language at the end of the year.		Receipts.				Charges.			Annual cost of educating each pupil.	Remarks.
				Hindoos.	Mahomedans.	Others.	Total.				Hindi.	Urdu.	From Municipality.	From others.	Total.		Current.	Extraordinary.	Total.		
													Rs. a. p.	Rs.	Rs. a. p.		Rs.	Rs. a. p.	Rs. a. p.	R. a. p.	
Ragged Schools.	City Benares,	10	June, 1871,	699	39		2740		562·40	606·80	740	24	1,023 4 0	25	1,048 4 0		633	415 4 0	1,048 4 0	1 11 7	

3.—MEMORANDUM BY M. KEMPSON, ESQ., M.A., *Director of Public Instruction, North-Western Provinces, Dated Nynee Tal, the 5th June*, 1872.

AN appropriate title for schools of this class would be "Municipal Free (or Charity) Schools." The term "Ragged School" is not popular in England, and means nothing here.

The school should be maintained for the benefit of poor families who wish to have their children taught to read and write, but cannot afford it. Care will be necessary to keep out the children of parents who can pay.

The cost of the schools should not exceed Rs. 100 a year on the average, which is about the cost of a fair Hulkabundi School.

The teachers appear to have been well selected at Benares,—that is to say, they are men from a Normal School, chosen in preference to the retainers or dependants of the managers. This is an excellent example.

The plan of giving cowries is, I think, a bad plan. The plea for the schools is that, there are parents who want education for their children but cannot afford it. It does not follow that money as well as education should be given. The custom is too common in Benares. I would, however, give rewards in money at the end of each year for a certain number, say 200, of attendances coupled with proficiency.

Next to the assignment of stipends for clever boys who wish to proceed to a higher course of study, the establishment of this class of school is a worthy object of municipal expenditure.

In Bareilly, the Municipal Schools are aided by the Government, and assume the higher function of feeders to the Government College. At Benares, the duty of this relation is performed by Aided Private Schools, such as the Bengalee Tola and Karanghanta Schools. At Shahjehanpore the Municipality maintains a free English School—a mistake, when

the Government supplies a Zillah School, and aids a Mission School besides.

The best form of Government aid to schools of the class under notice would be a free supply of school and prize books. Every boy might receive a primer as soon as he had mastered his alphabet sheet, and so on, as he proceeds from class to class. The Deputy Inspector could easily arrange this in concert with the Sub-Committee at his personal visits, and I would limit the amount of book supply to one-fourth of the cost of each school for a year.

There should, I am of opinion, be a limitation of the age of admission. No boy above the age of 14 should be admitted, and all boys who have reached a certain standard of reading, writing, and arithmetic should be struck off; but the teachers might be encouraged to open night schools for adults and young men.

4.—*From* C. A. ELLIOTT, ESQ., *Secy. to Government, North-Western Provinces, to* THE COMMISSIONER OF THE BENARES DIVISION, *No.* 608, *dated Allahabad, the 27th June,* 1872.

I AM directed to acknowledge the receipt of your letter No. 121, dated 18th May, 1872, reporting on the Ragged Schools in the city of Benares supported by the Municipality, and to state that His Honor the Lieutenant-Governor has received the information therein conveyed with much satisfaction.

2. The report was shown to the Director of Public Instruction for any remarks which he might have to offer, and a copy of a Note containing his suggestions is enclosed.

3. Mr. W. Forbes, C. B., deserves the credit, while Commissioner of Benares, of setting these schools on foot; and the liberality of the Maharajah of Vizianagram also contributed towards the same object. The Municipality of Benares quickly perceived the great public benefit thereby conferred on a mass

of the population to which the means of instruction were not otherwise open, and recognised it as a duty devolving on their corporation to assume the maintenance of these institutions as a municipal duty.

4. Your letter, with Mr. Kempson's Note, will be published in the "Gazette" and the "Selections from the Records of Government," in the hope that other Municipalities will follow the example.

5. Indeed, it appears to the Lieutenant-Governor that this is the line in which the aid of Municipalities may most legitimately be afforded to the spread of education. The cess on the Land Revenue enables the Government to establish Village Schools, which afford primary instruction to the agricultural population free of cost. But the Government has no funds for the establishment of such schools in towns, where all the Government Schools are of a higher order, involving the payment of fees.

6. The duty, then, which is discharged by means of the "Cess" in the interior villages of a district is one which very properly and legitimately devolves upon the revenues of the Municipality in towns; and their contributions to education can hardly be expended in any more useful manner. Scholarships may be useful as a stimulus to excellence, and for the maintenance of poor students, and they have therefore been recommended as a suitable mode of expenditure. But these free Schools appear to have a still stronger claim upon Municipalities, for by means of them a sound education in the elements of learning will be imparted to those who otherwise must be left to grow up in ignorance. Where the Octroi is in force, the poor contribute as well as the rich to the income of the Municipality, by their consumption of the necessaries of life; and these have therefore a special claim to be admitted to the benefits of the institutions supported from its revenues.

7. It is very gratifying to the Lieutenant-Governor to see in the Benares list so wide a representation of all the castes, even to the lowest.

8. The suggestions of Mr. Kempson as to the exclusion of children of families having means to pay for their schooling, and also as to the limit of age, are important, and should be attended to.

9. The name "Ragged Schools" is hardly suitable. The schools should be called "Municipal Free Schools."

Art. XVI.

REPORT ON THE BUTESUR FAIR OF 1871.

1.—*Report by* F. BAKER, ESQ., *Assistant Magistrate and Collector of Agra.*

1. *Origin of the Fair.*—Butesur Fair is held yearly on the last day or full moon of Kartik, and was originally instituted in honour of an image of Mahadeo said to have been found here under a *bar* tree by Sursen, the grandfather of Krishna. From this the place derives its name, the literal meaning of Butesur (Buteswur) being the tree-god. It also has other claims to sanctity on account of the Jumna flowing due west here, and of its possessing two "okhals." In its religious acceptation, this term is used to designate a spot where bathing has the effect of completely expunging the result of all former actions, whether good or bad. Budun Sing, 13th Raja of the Bhudouria Thakoors, who sat on the "guddi" from 1618 to 1656 A.D., and was cotemporary with Jehangir and Shah Jehan, founded the horse and cattle fair, which is now probably the largest of the kind in India.

2. *The village of Butesur.*—The village is situated on the right bank of the river and is distant 46 miles from Agra by road, and 12 miles from the Shekoabad Station on the East Indian Railway. Soorsen's well and "khera" are still pointed out at an older site some distance off, where there are some remains of Jain temples of great antiquity, and the traces of what must have been a very extensive village. A remarkable feature of the place is the Bisranth, or stone embankment, built by the Budun Sing before mentioned along the river side. It is 1,250 yards long, and on it stand 41 temples in all, 38 of which are sacred to Mahadeo. In the chief one in the centre, the image found by Soorsen is placed. It is apparently a block of perfectly smooth stone cylinder-shaped and about two feet high. Thirty-six flight of steps lead down to the water's edge, some of which have been seriously damaged by the force of the stream.

3. *The Site of the Fair.*—The fair is held in a long, narrow valley, formerly an old course of the river running from the Bisranth to the Naringhee Bah Ferry, a distance of about two miles. The nature of the ground makes it appear, at first sight, as if the embankment had diverted the course of the Jumna, so as to make Butesur be on the right bank instead of on the left. There is a popular tradition that Budun Singh, one day, when intoxicated, told the Emperor Akbar that Butesur was on the right bank, and afterwards built the Bisranth to avoid the stain of falsehood. The real solution is that this valley for about six hundred yards is a cutting made by him through some high ground which alone prevented Butesur from being completely surrounded by the river.

The cause of the loop being forsaken by the stream is another cutting made many years after by Aurangzeb, or a daughter of his, at Naringhee Bah (Naringhee is a corruption from Aurangzeb).

4. *Ravages of the River this year.*—In the rains this valley naturally serves as an outlet for the floods, but the water hitherto has always flowed off in a short time without leaving any trace behind it. This year the rise of the Jumna was quite unprecedented, and the site of the fair cut up so badly as to make it doubtful whether it would be possible to hold it in the usual place.

Several large excavations were hollowed out to a great depth, and much of the ground was little better than a mere swamp from which the water kept oozing up to the surface almost as fast as it was carried off by evaporation. The roads were levelled and made even at the expense of the Fair Funds; but it was left to each individual to smooth the space selected by him for his own occupation. Most of the shopkeepers keep to the same spot year after year, and nothing short of absolute necessity would induce them to change.

5. *Arrangement of the Horses.*—Before 1866 no attempt was made to preserve any order amongst the horses, and

only two main roads, running down each side of the fair, were marked out. Now the ground is divided into parallel plots of 30 feet wide, with a space of ten feet left clear between each. In the former the horses stand in rows and the latter serves as a path, so that any horse can be easily inspected. This arrangement has been found to work admirably and prevents any crowding or confusion.

6. *The Census.*—The bathing day, *i. e.*, the day of the full-moon, fell this year on the 20th November, considerably later than usual. The gathering began about the 20th November. An attempt was made for the first time to count the numbers attending. The two main roads offered great facilities for doing this; that from Shekoabad passing over the bridge of boats at Naringhee Bah, and that from Agra through a narrow defile in the ravines of the Jumna.

7. *Number of people counted.*—The returns are as follows, commencing from the 20th November when it was estimated there were about 3,000 persons already present:—

	20.	21.	22.	23.	24.	25.	26.	Total
Agra road, ...	581	823	1,862	5,800	14,800	25,200	37,915	86,981
Shekoabad do.,	516	1,303	1,131	3,533	5,877	11,656	18,331	42,347
Ferries, ...	662	1,026	1,591	1,805	1,904	4,146	4,538	15,672
	1,759	3,152	4,584	11,138	22,581	41,002	60,784	1,45,000
Number present each day, ...	4,759	7,911	12,495	23,633	46,214	87,216	1,48,000	

Many would also come from the surrounding villages by bye-ways and not be reckoned. In round numbers the total attendance might be put down at not less than 1,50,000. It will be seen two-thirds of the whole come in the last two days, and nearly six-sevenths in the last three. These probably left almost immediately after the bathing day, and by the end of the week only a few shopkeepers and others remained.

8. *Religious ceremonies.*—The evening before the bathing day all who have lost a relative during the year put three or four oil lamps on a little raft of straw and float them down the stream. The bathing begins when the moon reaches its full and goes on all day. Each bather offers a lotah of water with a mixture of sandal-wood, *dhup*, *nariyal*, *belputr*, and rice to the image in the chief temple, and makes at the same time a small present in money. The Bhudouria Raja's contribution is five maunds of rice and Rs. 25 in cash. The total offerings amount to as much as Rs. 1,500, and are divided amongst the Jogis, who are the hereditary custodians of the temples. A Brahmin family also has a share in defiance of the rule laid down in the Shastras that the offerings to Mahadeo are to be taken by Jogis alone. It is said to have been formerly very numerous in Butesur, but has now dwindled down to a solitary widow, on whose death it will have become extinct. Another story is that a Bhungi once went near the image, which turned yellow and did not resume its proper color for three months, during which Brahmins kept constantly praying to Mahadeo and reading the Vedas.

9. *Character of the Fair*—The horse and cattle fair must have been at first a mere local mart to supply the wants of the Bhudouria Raja and his followers, and then have gradually gone on increasing in importance, especially under the security afforded by the British rule. Formerly horses of the highest breeds used to be brought, which sold for enormous prices, but the fair now is chiefly supported by the Native Cavalry Regiments, who purchase a large number of remounts here every year. They require a good strong, sound, serviceable animal, about 15 hands high, from 4 to 6 years old, and at a price of from Rs. 200 to Rs. 250. A few more valuable horses may still be seen, but the demand for them is very limited. The greater number come from the districts in the Meerut Division and the Punjab; comparatively few are bred in the immediate neighbourhood, and those mostly of an inferior class.

10. *Estimated number of Horses brought.*—The general opinion appeared to be that there was a slight falling off both in the number and quality of the horses this year. They have never yet been counted, so that nothing accurate can be known on this point, but I think this might be done with advantage in future. Altogether, there were probably about 5,000 present, many of these being mere tattoos and old worn-out creatures worth next to nothing. Buyers were more numerous than usual, and prices consequently ruled high. No less than 13 cavalry regiments were represented, one of which is stationed near Peshawur, and another beyond the Indus, showing the notoriety Butesur has attained. The bargaining between officers and the horse-owners is chiefly carried on through *dallals*, and a great deal depends on securing the services of an efficient one. Native buyers and sellers have a way of their own of settling the price, unknown to bystanders, by putting their own hands under a cloth and carrying on a kind of dumb arithmetic by feeling the points of the fingers. No purchase is considered complete till one rupee earnest-money has been given, when neither party can recede. Only one or two instances of disputed sales came to my notice during the whole of the fair, and these were eventually settled amicably.

11. *Great Prevalence of Unsoundness.*—The horses had all been fed on drugs and spices beforehand to bring them into condition. Unsoundness in almost every shape and form was terribly prevalent, but more especially from curbs, splints, and spavins. They originate from the colts being ridden at too early an age, from the sudden and violent turns they are made to go through, and from the way in which they are always kept tightly reigned up and taught to perform fantastic tricks. The horses are left entire, which necessitates their being confined and tied up too soon. Fillies, which are allowed to retain their liberty longer, are much more free from defects. At the Rawul Pindee fair prizes are given for the best horses in various classes, and every effort is being made to encourage the practice of gelding colts when young, as in England.

Considering the important position Butesur holds as a horse fair, it seems strange that nothing has hitherto been done in this way. I would suggest that the example set at Rawul Pindee should be followed so as to try to induce the natives to adopt a more rational system of rearing and breaking than that which at present prevails.

12. *Number of Horses Sold.*—According to the usual custom, the Tehseel treasury is moved to the fair for the purpose of cashing officers' Transfer Receipts. The total sum paid out was Rs. 41,413; Rs. 29,903 in payment of bills, and Rs. 11,510 in exchange for currency notes; sellers positively refused to take the latter, and the privilege allowed to Government servants of cashing them was extended to private individuals also, as far as the funds in hand would allow. Taking Rs. 250 as the average price of a horse, the amount paid from the Tehseel shows that 165 were bought for Government purposes alone. Altogether from 500 to 750 may have been sold, but this is necessarily a mere guess, as there are no other data to calculate from.

13. *Camels and Bullocks.*—There appeared to be rather fewer camels than horses, but more bullocks. In round numbers there may have been 4,000 of the former and 6 to 7,000 of the latter.

A good riding camel would fetch from Rs. 225 downwards, those for carrying from Rs. 125. The bullocks sold at from Rs. 150 per pair, and were slightly dearer than usual. These last do not come down into the valley, but remain on the high ground above. Four elephants were brought for sale, but did not find a purchaser.

14. *General trade.*—A considerable trade is also done in miscellaneous merchandise, the fair offering a convenient opportunity to villagers of supplying themselves with the ordinary requisites for their families, while the petty dealers round about lay in a stock from the wholesale merchants who attend. The principal bazaar comes from Agra, but Mynpoorie, Furruckabad, Etawah, Cawnpore and other places are well repre-

sented. This year 1,704 shops of all kinds were counted. Most of the people bring their provisions with them. The prices of articles of food do not rise above those current at the time in Agra.

15 *Sanitation.*—There were no sanitary arrangements properly speaking till 1867, when latrines were constructed for the first time. As there was more than usual cause for anxiety this year, the site was inspected by Dr. May, the Officiating Civil Surgeon, on the 19th November, and he made various practical suggestions which were carried out, and also sent a Sub-Assistant Surgeon to take medical charge of the Fair.

16. *Measures adopted.*—The roads and surface generally were kept clean by sweepers paid from the Fair Funds. Horse keepers collected the dung during the day and burnt it at night. Any animal dying was immediately carried out and buried at the owner's expense. The latrines, 22 in number, 16 for men and 6 for women, were constructed on the plan laid down by Government in the rules for the regulation of important fairs, *i. e.*, with screens 6 feet high, trenches 12 inches deep and, where practicable, not less than 30 yards square. Those not wishing to use them were at liberty to go beyond the flags which were posted round the fair at a distance of about half a mile off. Including those employed in the fair itself, 84 sweepers in all were attached to them, and besides there was a staff of 28 chuprassees temporarily entertained to arrest offenders. Their working, on the whole, was very satisfactory, and the dislike formerly felt to them by the people seems to be gradually dying out.

17. *Hospitals.*—The number of those who applied for medical treatment was 75, of whom 9 only were admitted to the hospital as in-door patients. This is somewhat in excess of former years, but rather shows that English medicines were more readily resorted to than that there was an increased amount of sickness. The presence of the Sub-Assistant Surgeon relieved me of very great anxiety, as, although Butesur is noted for there never having been any outbreak of disease

there, yet, with cholera at Lucknow and Delhie, it is a subject for congratulation that all went off so well. Fever was very prevalent in the surrounding villages at the time, but those not in good health would naturally stay away, and all the cases were of a comparatively slight nature. There was a second hospital for contagious diseases, but fortunately no patient had to be admitted. The Police arrangements, as last year, were under the superintendence of Mr. Hyde, European Inspector. He left Agra on the 16th November and reached Butesur on the 19th. The total force attending the fair was one European Inspector, one Sub-Inspector, nine mounted constables, 17 head constables, 83 constables, and 126 chowkeedars. These were distributed in chowkees throughout the fair itself and the approaches leading to it. The crime this year was very much less than last, a result highly creditable to Mr. Hyde, who has now been to Butesur several years in succession and acquired valuable experience. The value of the property stolen amounted to only Rs. 57-11-9 of which Rs. 47-11-9 were recovered. It is a common trick of thieves to turn a horse loose at night, and in the general confusion which follows to snatch up whatever they can lay hands on. But the manœuvre this year could have met with little success. Altogether, there were 15 cases of theft, and one of passing counterfeit coin; 12 arrests and the same number of convictions; 107 were also punished for infringment of the sanitary rules. All lathees and weapons of any kind are taken away at the entrances to the fair; there was not a single case of assault or causing hurt. The roads leading to it were patrolled by chowkeedars from the neighbouring villages; no crime was reported as having occurred on them. The police left on the 4th and 5th December, when the Thanahdar of Butesur remained in charge.

19. *Income and Expenditure.*—The income of the fair is entirely derived from the receipts of the bridge-of-boats at Naringhee Bah. Before 1866 these were put up to auction and leased out to the highest bidder, the amount realized being credited to the Ferry Fund. Since then the tolls have been collected by the Tehseel officials, and the expenses of the fair

defrayed from them. The balance of income over expenditure during the last five years has been Rs. 2,297-7-0 which has been paid into the Ferry Fund. The total receipts for 1871 were Rs. 2,481-12-3, higher than they have ever been before. The expenditure was as follows:—

Expenditure.	Rs.	a.	p.	Rs.	a.	p.	Remarks.
Bridge.—Wages for construction, &c.,	43	10	0				
Materials used in ditto, ...	72	5	0				
Carriage of planks, ...	6	0	0				
Ditto of cash-box, ...	1	0	0				
Shed for cash-box, ...	7	2	0				
Mallahs' share of ferry tolls, ...	24	8	9				
Tehseel Officials, ...	43	7	3				
Ditto chuprassees, ...	20	0	0				
				339	5	0	
Roads.—In interior of fair, ...	247	0	9				
To Naringhee Bah, ...	34	8	6				
				281	9	3	
Cleaning.—Officers' encamping ground,	25	12	6	25	12	6	
Latrines.—Materials for construction,	157	6	4				
Labour for digging trenches, ...	50	1	9				New item.
Wages of chuprassees, ...	45	0	2				
Ditto of sweepers, ...	160	12	3				
				413	4	6	
Hospitals.—Cost of construction, ...	41	9	0				
Diet and contingent charges, ...	6	12	7				
Travelling Allowance and Deputation Allowance of Sub-Assistant Surgeon,	33	12	0				New item.
Ditto Hospital Assistant, ...	9	11	7				
				91	13	2	
Police.—Rent of Bagh, ...	12	0	0				
Construction of Chowkees, ...	27	2	3				
Mainpoorie Police, ...	197	1	0				
				236	3	3	Ditto.
Watering Roads, ...	67	11	0	67	11	0	
Sundries.—Crier, ...	1	0	0	4	0	9	
Scaffolding in Temple, ...	3	0	9				
GRAND TOTAL. ...				1,459	11	5	

20. *Causes of Increase.*—The expenditure in 1870 was Rs. 1,079-15-0, so that the increase this year is Rs. 379-12-1. Of this, Rs. 275-13-2 is owing to new items, and the remainder to the increased cost of making the roads consequent on the ravages of the river, and the high price of the jowar stalks used for constructing the latrines.

21. The surplus remaining is Rs. 1,022-0-10; 100 planks are still required to complete the bridge, which at former prices

would cost Rs. 511-11-4. The Bisranth appears to stand greatly in need of repairs, and the remainder might be spent either in doing these, or in prizes for horses, as before suggested. Except in the event of any unusual occurrence, the income of the fair, as at present derived, is amply sufficient to meet the expenses. There is an apparent injustice in the whole burden being borne by those who come by way of the bridge, but long custom prevents this being in any way felt.

2.—*From the* SECRETARY TO THE GOVERNMENT *of the North-Western Provinces, to the* OFFICIATING COMMISSIONER *of the Agra Division, No.* 1523*A.*—*Dated Allahabad, the 26th of April,* 1872.

I AM directed to acknowledge the receipt of your docket No. 380I, dated the 30th March last, with enclosures, being a report on the Butesur Fair of 1871.

2. The last and great day of the fair was 26th November. Mr. Baker's report did not reach this office untill 10th April. A report which comes so long after the events with which it deals loses much of its interest, and His Honor looks for its more punctual submission in future.

* * * * *

4. The arrangements at the fair were admirable in every way, and show much thought on the part of the District Officers. Difficulties were anticipated owing to the site having been under water till late in the season, but these were surmounted by the forethought of the Magistrate and his Assistants.

5. The largest attendance on any day is estimated at 1,40,000 by the Sub-Assistant Surgeon, but at 60.784 by Mr. Baker, who attempted to make a census of the visitors, which was not apparently successful, and is unnecessary. It is sufficient to give approximately the numbers present.

6. The general health of the visitors was, as usual, good. There were but nine admissions to hospital, and one death from apoplexy.

7. It is satisfactory that there was so little crime.

8. The police, who were well managed under Inspector Hyde, consisted of one Sub-Inspector, 7 Mounted Constables, 17 Head Constables, and 83 Constables, and 126 Chowkeedars. These were, it is presumed, drawn from the district, and, as no charge appears on account of them in the fair accounts, it is understood that no expense was incurred by the employment of substitutes for duty in the localities from which they were removed. If there was, it should be shown in the accounts.

* * * * *

11. The income derived from the bridge of boats at Naringhee Bah was Rs. 2,481 against Rs. 2,217 in 1870. The charges amounted to Rs. 1,459, and there is a surplus of Rs. 1,022, of which a moiety is apparently required for planks to complete the bridge.

12. Mr. Baker's suggestion that the rest of the surplus might be spent either in offering prizes for the best horses at the next fair or in repairing the Bisranth embankment along the Jumna will be considered when the question of the payment of the police referred to in paras. 8 and 9, has been settled. It seems to the Lieutenant-Governor that the improvement of the place, and in an especial degree the repair of the Bisranth embankment are the first objects on which funds of this kind should be expended. And for this purpose it would be quite legitimate to provide for even a larger surplus than has been secured this year. Mr. Baker is quite right in saying that the object is not to derive a revenue from these fairs, but it is legitimate to make full provision for all incidental expenditure, and such collateral objects as local improvements and arrangements to promote the health and comfort of the frequenters. The sum at present raised may suffice for all ordinary occasions; but in case of epidemic sickness, or the necessity to carry out any considerable work, it would be inadequate. In this view it may be open to consideration whether a larger annual income should not be raised.

Art. XVII.

REPORT ON THE ALLAHABAD PUBLIC LIBRARY AND MUSEUM FOR THE YEAR 1871-72.

1.—*Report by* CAPTAIN CHARLES A. DODD, *Secretary to the Public Museum and Library Committee,* (*No.* 1).—*Dated Allahabad, the* 1*st May,* 1872.

I HAVE the honour, by direction of the Committee of Management, to submit the following report on the Allahabad Public Library and Museum for the year 1871-72.

2. On reference to my last report, you will perceive that there was an actual balance in hand of Rs. 7,389-5-1, exclusive of the sum of Rs. 3,336-8-0 at the credit of the building account. To this sum, during the past year has been added the annual grant from Government for 1871-72 of Rs. 3,600, making a total of Rs. 14,325-13-1. The expenditure during 1871-72 may be summarized as follows :—

	Rs.	a.	p.
Purchase of books, ...	3,233	9	11
Purchase of dead-stock, ...	304	12	0
Cost of Establishment, ...	660	0	0
House-rent, ...	900	0	0
Petty Contingencies, ...	518	1	6
Total, Rs.	5,616	7	5

Leaving a balance in hand at the close of the year of Rs. 8,709-5-8, or deducting Rs. 3,336-8-0 to credit of the building fund, a net balance of Rs. 5,372-13-8. The Committee propose to place the building fund money in the Government Savings Bank, and, with a portion of the interest, to appoint a *furrash* to look after the articles and books in the Museum and Library. This increase to our present menial establishment is much required.

MUSEUM.

3. During the past year the following contributions of articles to the Museum have been received, for which the Committee desire to tender their best thanks:—

I.—From E. T. Atkinson, Esquire:—

(*a*) A Collection of Indian Butterflies.
(*b*) A Collection of Birds' Skins.

II.—From A. Tucker, Esquire:—

3 Dendrocygna awsuree.
1 Actitis glareola.
1 Herpestes griseus.
1 Uromastix Hardwickii.

III.—From J. Cockburn, Esquire:—

Mammalia.

Two pair frontal bones and horns of Portax pictus.
Inferior maxilary bone of Sus Indicus, with fine pair of tusks.
Ditto ditto of Innus rhesus.
Ditto ditto of Portax pictus.

Aves.

Stuffed specimens:—

1 Ruticilla rufiventris.
1 Merops viridis.

2 Brachypternus aurantius (male and female).
Section of skull of Leptoptilos argala.
Nest of Prina socialis.

Reptilia.

(Sauria.)

2	Stuffed specimens,	... Gharialis Gangeticus.
1	ditto ditto,	... Varanus Bengalensis.
1	ditto ditto,	... Uromastix Hardwickii.
In	spirits,	... Hemidactylus marmoratus.
1	ditto,	... Euprepes rufescens.
2	ditto,	... Calotes versicolor.
1	ditto,	... Uromastix Hardwickii.
2	ditto,	... Sitana Pondiceriana.

(*Ophidia.*)

1	specimen in spirits,	... Dendrophis picta.
2	ditto,	... Tropidonotus stolatus.
3	ditto,	... ditto, quincunciatus.
1	ditto,	... Echis carinata.
2	ditto,	... Lycodon aulicus.
1	ditto,	... Naja larvata.
1	ditto stuffed,	... Ditto.

Eggs of T. quincunciatus.

IV.—From Dr. Valentine, of Jeypore :—

10 specimens of marble images made at Jeypore, received in exchange of the duplicate specimens of the timber.

4. With regard to the Museum, the Committee would observe that, possibly by the exercise of a little influence and trouble, they could secure a far larger contribution of specimens every year than they have hitherto obtained. The present building, however, like most houses in this station, is

overrun with rats and white-ants, and nothing is proof against their depredations. Notwithstanding that every precaution was adopted to protect articles from the influence of the weather, a handsome fan made of peacock's feathers, and the fish presented by the Revd. J. J. Walsh, noted as contribution No. IV. in my last report, were destroyed in the course of a few hours during the last rains. Were we greatly to increase the stock in our present building, it would become necessary to secure the services of a special Curator to keep constant watch day and night over the specimens. Under these circumstances, while they would be loth to decline acceptance of any contributions which may from time to time be sent to the Museum, the Committee considers it would be better to defer any special action for securing articles of a perishable nature till the institution is transferred to the Thornhill Memorial, and there placed on a more satisfactory footing.

LIBRARY.

5. The Committee have to acknowledge the presentations to the Library of the following works during the past year :—

1. From the Honorable Sir W. Muir, K.C.S.I. :—

Cowell's Lectures on Hindu Law, 1871, ...	1	Vol.
Grammatica Linguae Persicae,... ...	1	„
Zeitschrift der Duitschen Morganlandischen Gesellschaft (Nos. 1 to 4 of 1870), ...	3	„

2. From C. A. Elliott, Esq., B.C.S. :—

The Chronicles of Oonao, ...	1	„
Report on the Revenue Settlement of Hoshungabad,...	1	„

3.—From T. W. Rawlins, Esq. :—

Heads of the People, or the Portraits of English, ...	2	„

4.—From J. Cockburn, Esq.:—

Maunder's Treasury of Bible Knowledge, ...	1	Vol.
Lectures on the Diseases of Women, ...	1	„

5.—From Proprietor of *Delhi Gazette* Press:—

A copy of *Delhi Gazette* for 1871.

6.—From Proprietor, *Pioneer* Press:—

A copy of *Pioneer* for 1870-71.

7.—A number of Books and Pamphlets (274) from Government.

6. Attached to this report will be found two Statements, A. and B., showing the works purchased during the year,—the former of books arrived and actually on the shelves of the Library, and the latter of those purchased and paid for, but which are still *en route* from England. The Committee trust that their selections during the past year will meet with His Honor's approval. In addition to the above, advantage was taken of Mr. Sherer's recent visit to England to disburse the sum of £50 to that gentleman with instructions to purchase any work not already in our possession, which he might consider of value to the Library. The Committee have not yet been placed in possession of a list of the books purchased by Mr. Sherer, but they have no doubt the result of his arrangements will prove a useful addition to our present collection of works. I may note that, in all orders sent to England for books, His Honor's wishes, contained in para. 4 of your letter No. 2173A., dated 15th of May, 1871, have been carefully recorded, and all books received during the year have been bound in a manner suitable to the rough usage to which they are liable in a Public Library.

7. In 1871-72, the works in this Library were consulted by a large number of visitors, some 1,450 books having been taken out during the year. The Committee are happy to

report that the popularity of the Institution has not resulted in any serious loss of or damage to the books, only two volumes having been mislaid since the Library was for the first time open to the public—some four or five years ago. Under these circumstances, the Committee did not consider themselves justified in accepting a proposal laid before them at their last annual meeting, to levy a small fee on works taken out of the Library. The amount realized in the course of the year would be trifling, and altogether incommensurate with the withdrawal of the highly appreciated privilege accorded to the public under existing arrangements. I may add, that no rare work or books of reference are allowed to leave the Library; and that in future, for the information of visitors, all such volumes will be conspicuously labelled with the words "Not to be removed."

8. The Committee are glad to be in a position to announce the completion and publication of a catalogue during the year under review. Every work in the Library has been carefully classified according to subjects, and so arranged that a stranger in possession of a catalogue would find little or no difficulty in discovering the book he required. The catalogue consists of 247 pages, and is supplemented by an alphabetical list of authors, with an index-number of the page in which their publications are recorded.

9. In para. 6 of my report in 1870-71 will be found a list of magazines which it was proposed to receive in the Library immediately on publication. During the past year this proposal has been abandoned—the Committee being of opinion that the yearly allowance might be more profitably laid out in the purchase of standard works than of publications which are for the most part of an ephemeral nature.

10. In conclusion, the Committee are happy to report that, in their opinion, this branch of the Institution under their charge has now assumed proportions and been placed

on a footing worthy of a Provincial Library. They have now in their possession upwards of 7,000 volumes, most of them works of the greatest value, and some of them exceedingly rare; an effective check against loss has been adopted; each book has been classified, labelled, and arranged, so as to ensure easy access; a catalogue has been carefully prepared, and is now available to the public, and every arrangement has been made to secure facility of reference to any one desirous of consulting the several works which the Library contains. Under the circumstances detailed in para. 4 of this report, the Committee propose for the present to devote more attention to this branch of the Institution than to the Museum, and they trust that by the time the Thornhill Memorial is finished, they will be able to transfer to its halls one of the best and most complete Libraries in India.

2.—*Government reply on above to* CAPTAIN C. A. DODD, *Secretary to Government Museum and Library Committee, Allahabad* (*No.* 1990A.).—*Dated Nynee Tal, the* 31*st May*, 1872.

I AM directed to acknowledge the receipt of your letter No. 1, dated 1st May, 1872, being the report on the Allahabad Public Museum and Library for the year 1871-72.

2. In reply, I am to convey the thanks of the Lieutenant-Governor to the Committee for their management of the Museum and Library, and to say that the purchases of new works made by them appear to have been judicious.

3. The Committee may well report, with pride, that the Library is now becoming one of the most valuable and extensive out of the Presidency towns.

4. The Lieutenant-Governor regrets much that the accommodation for the Museum Department is so insecure and insufficient. The Thornhill Memorial is, however, being

pushed on, and His Honor trusts in a short time the Committee will be able to invite contributions, without the apprehension of insufficient means of protecting them.

5. The building balance, Rs. 3,336-8-0, should be transferred to the Department Public Works of this Government, to be added to the allotment at the lisposal of the Building Committee.

Art. XVIII.

VACCINATION RETURNS, N.-W. PROVINCES, FOR 1871-72.

1.—*Report by* SURGEON-MAJOR F. PEARSON, *Supdt.-General of Vaccination, N.-W. Provinces* (*No.* 252).—*Dated Almorah, 29th April,* 1872.

I HAVE the honour to submit, for the information of His Honor the Lieutenant-Governor, the Returns of Vaccination for the North-Western Provinces, for the year 1871-72.

2. *General Remarks.*—These returns show a grand total vaccinated of 321,742, being an increase of 10,132 over that of the previous year, notwithstanding there having been 14 vaccinators less, as the work done by the local establishments in the Bundelkhund States has been this year excluded.

The average percentage of success is 88·26, being nearly 3 per cent. higher than that of the previous season.

The average number of persons vaccinated by each vaccinator per mensem (during the vaccine working season) is 238·2, as compared with 219·4 of the previous year.

The average cost per successful case has been exactly five annas. Both the number vaccinated and the percentage of success will reach a yet higher figure, as the people evince a greater readiness to accept vaccination, and the establishments become more skilled in their art. Next year I intend adding a column for the low castes, so that it will be possible then to determine what way vaccination is making amongst higher classes, which I am unable to do now, when they are all included under the one head "Hindoos." The number of revaccinations are but small; as years go on, the amount should

steadily increase; for it is now an established fact that revaccination is desirable at the period of life when the constitution has undergone the change from childhood into manhood, with a view to ascertaining if full protection is still enjoyed.

I give a summary below, which will show at a glance the main facts of the two past season's operations:—

SUMMARY.

1			1870-71,	1871-72,
2	No. of Native Superintendents.		37	36
3	No. of Vaccinators.		284	270
4	Total No. of persons vaccinated.		311,610	321,742
5	*Sex.*	Male.	154,861	159,761
		Female.	151,290	159,417
	Caste.	Christian.	1,649	1,641
		Hindoo.	252,236	267,678
		Mussalman.	52,266	49,949
	Age.	Under one year.	91,994	108,263
		Above one year.	214,167	210,905
	Primary Vaccination Result.	Successful.	242,614	261,914
		Unsuccessful and Doubtful.	40,216	34,527
		Unknown.	23,324	22,727
		Total.	306,151	319,168
6	*Secondary Vaccination Result.*	Successful.	2,248	1,682
		Unsuccessful and Doubtful.	2,285	607
		Unknown.	926	285
		Total.	5,459	2,574
7	Primary percentage of success.		85·7	88·26
8	Secondary percentage of success.		49·6	73·48
9	Average No. of persons vaccinated by each Vaccinator per mensem.		219·4	238·2

3. *The Kumaon and Rohilkhund Circle: (a) Kumaon Division.*—This, the oldest of all the Divisions, is maintaining its lead in the percentage of success amongst those operated upon, the average having been during the past season 95·05—a figure one can hardly expect to see higher. The inference to be drawn from the above is, that the longer the training the greater the skill on the part of the operator—a fact adverse to the general opinion that any fool can fully acquire the art of vaccination within a few days, more or less. The average numbers vaccinated by each vaccinator per mensem would also doubtless show Kumaon at the top of the list, only that the difficult nature of the country, and the scattered positions of the inhabitants, render such an attainment impossible. The increase in the numbers done during the past season (37,457, as compared with the 28,537 of the previous season) is chiefly an unreal increase, for the work done in the Terai Pergunnahs is now included in the Kumaon Division instead of, as formerly, in the Rohilkhund Circle.

The two additional vaccinators sanctioned for Gurhwal principally account for what actual increase there is over the season of 1870-71. It will be observed that there has been a diminution in the amount done in the Kumaon hills' portion of the Division; this is owing to the fact of the vaccine establishments having been worked there at high pressure during the previous year, by reason of some cases of small-pox having occurred. The staff of establishments in the hill tracts of the Kumaon Division is considerably under the strength it should be, and will form the subject of a separate communication.

(*b*) *Rohilkhund Division.*—This division stands the highest of all the plains circles in the numbers vaccinated by each vaccinator per mensem (360·93)—a position accounted for by the fact of the practice of vaccination having been longest in operation in this circle, and forming the highest praise that can be given in favor of the present system, that it is most appreciated where it is best known. During the past season

9 Municipal vaccinators have been added to the strength of the 11 previously maintained, an increase most creditable to the Municipalities in Rohilkhund; in fact, this division stands out prominently in this respect as an example of intelligence and liberality to all the other circles. It is the first to have carried out the wishes of His Honor the Lieutenant-Governor that Municipalities should provide for their own vaccination.

The numbers vaccinated during the past season were 84,820, the previous season's work being 73,838. The increase is entirely owing to the increased number of vaccinators, for the amount actually done by each vaccinator remains almost exactly the same, within a fraction, as that of last year.

The work accomplished in this circle proves that the energies and tact of the Deputy Superintendent, Baboo Bundeedeen, are undiminished.

4. *Agra and Meerut Circle.*—The total number vaccinated in this circle during the past season is 96,646, as compared with 87,836 of the previous year; the increase being chiefly due to the returns from the Tehree, Gurhwal, country being embodied in the return of this year, and to the fact of there having been six additional vaccinators, so that practically the average amount of work done remains much about the same. The percentage of success, however, is higher, being 90·8, instead of 88·9, which is a satisfactory feature in this respect, the Agra and Meerut ranking next best to the Rohilkhund Circle.

The establishments in Tehree, Gurhwal (one Native Superintendent and four vaccinators), maintained at the expense of the Rajah, are doing excellent service, not only in diminishing small-pox amongst the Rajah's own subjects, but in the large supplies of vaccine virus they furnish for distribution elsewhere. Dr. Pringle proposes that the doubling of the vaccine establishments sanctioned for the Meerut Zillah should be made in the Saharunpore Zillah. I am, however, of opinion

that this change should not be made; for by reason of the large Cantonment and European population in the Meerut Zillah, it is desirable that it should enjoy the extra protection to be conferred by the increase of establishment. As regards the permission requested for letters of thanks to be sent to the several Native gentlemen who have evinced interest in vaccination, mentioned by the several Superintendents in their reports, I would suggest that His Honor authorize me to send expressions of his approval.

Dr. Pringle's enthusiastic efforts on behalf of the people committed to his vaccine care continue unabated.

5. *Benares Circle.*—The numbers vaccinated in this circle during the past season were 44,867—an increase of 1,195 as compared with the previous season's work of 43,672; but as there were two additional Municipal vaccinators, the average amount done by each vaccinator remains practically about the same as that of last year. The percentage of success, 88·1, is fairly good; and about the same as that of last season. This circle has many disadvantages, the most formidable being the strong opposition it has to encounter from the inoculators; but as this class becomes largely absorbed into the vaccine establishment, difficulties will disappear; and in fact, from what has already happened under Dr. Milne's and Dr. Richardson's wise and careful superintendence, there is but little doubt that the success already gained will continue to be progressive.

The complaints made in para. 9, and subsequent paras. of Dr. Richardson's Report, against the system of vaccination by "omedwars," &c., will disappear under the new regulations of having only regularly entertained apprentices duly selected and taught. It is no doubt much too early to attempt any general plan of instructing any class of Native practitioner with a view to his pursuing the art of vaccination for private gain, as the people are not yet sufficiently acquainted with the practice of vaccination to be able to discriminate as to the reli-

ability or otherwise of the services offered. Upon the other points in Dr. Richardson's Report, they being chiefly departmental, I have issued the necessary orders. I would remark that, though the average number of vaccinations performed by each vaccinator per mensem is put down at 243, yet in reality it is a somewhat fictitious figure, for each vaccinator has, as a rule, been assisted in his work by one or more paid "omedwars," chiefly of the inoculator class. It is necessary to mention this, otherwise comparisons too favorable to this circle might be drawn to the detriment of the other circles. Now that the system of "omedwars" is to be stopped, these undue averages will disappear also.

6. *Allahabad and Jhansie Circle.*—The numbers vaccinated in this circle during the past season were 59,097—an increase of 5,420 over those (53,677) of the previous year; but as there were seven additional local vaccinators, the increase is accounted for.

The average amount of vaccination per mensem performed by each vaccinator remains pretty nearly the same as in the previous year, *viz.*, 161 as compared with 164. The average percentage of success is considerably improved, being 81 as compared with 74·77. There has been but a very unsatisfactory amount of work accomplished in the Jaloun Zillah, which Dr. Watson rightly attributes to the fact of temporarily entertained vaccinators being employed. So pernicious do I consider this practice that I have directed its discontinuance. Bad vaccination is ruin to the cause, and good vaccination can only be given at the hands of men thoroughly trained and permanently entertained; so where municipal or local funds will not admit (either alone or in combination) of an annual sum of Rs. 120 (12 months' pay of a vaccinator), it is better that no contribution be made for vaccination purposes. The Cawnpore and Futtehpore districts show a very fair amount of work accomplished, but the other districts lag a good deal. The explanations offered by Dr. Watson (pre-

judices on the part of the people, and, in the case of Allahabad, in some measure to a change in the establishments) are I think the evident causes. Anyhow, I feel convinced it is not attributable to any want of interest on the part of Dr. Watson, for in knowledge of the Natives, both as regards their language, customs, and feelings, he is unsurpassed, and is most conscientious in the discharge of his duties. I quite agree with Drs. Pringle's, Watson's, Richardson's, and Milne's views regarding animal vaccination, and I trust that no more attempts will be made in that direction. Any interference with the cow is most impolitic and dangerous; it can moreover lead to no possible good, for the vaccine virus that we have in use is of most excellent quality and needs no improvement. Animal vaccination has not been accepted in England, for it is not found to possess any of the advantages claimed for it by the few enthusiasts who brought it forward.

I have not embodied the vaccination performed in the Bundelkhund States in the North-Western Provinces' Returns, for the system in vogue there is entirely different. I will make it the subject of a separate communication.

7. *Kumaon and Gurhwal Vaccine Depôt.*—The amount of vaccine virus received and distributed from this depôt to India during the past year was as under:—

1871-72.

Vaccine Crusts distributed.	Vaccine Tubes distributed.
16,132	2,951

The amount is more than sufficient to meet all requirements. I would remark that, if a debit and credit account was kept of the actual money value of the above supplies, at the lowest estimate, it could be shown that the Kumaon Division was more than self-supporting. One hundred tubes of vaccine virus from England were received in September last, but neither as

regards the character of the lymph or the amount of success achieved could it compare favorably with that from the Kumaon Hills. It is chiefly useful to meet the demands of European mammas, who are afraid to expose their children to the risk of some imaginary peril supposed to be in lymph which has ran its course through a black child, ignoring the fact that the sources of our supply in the Hills are certainly of as pure, if not purer origin, than is generally met with at the vaccine stations in our crowded England cities from which the supplies sent out are usually taken. The chances of contamination are, however, so infinitesimal under any circumstances, that even the thought of the possibility may be entirely excluded. Many hundreds of thousands have been vaccinated by my department during the 18 years that I have had the honor to belong to it, and I can unhesitatingly say that I have never seen or heard of any one single case in which any constitutional or local taint has been conveyed.

8. *Municipalities to provide for their own Vaccination.*—It being the desire of Government that Municipalities should, as far as is possible, pay for their own vaccination, every Municipality in the North-Western Provinces has been addressed on the subject. It has been pointed out to them that where the population falls considerably below 30,000 (the number that a vaccinator is, under present circumstances, calculated as able to protect) two small Municipalities might combine to support one vaccinator between them, though such a course is not recommended (except in case of great pecuniary stress); for any spare time that the vaccinator may have might be usefully employed in protecting the neighbouring suburbs and villages, and thus diminishing the chance of the importation of small-pox within the municipal limits. The lower grade pay of a municipal vaccinator is only Rs. 120 per annum. I beg to submit a list of municipalities in the North-Western Provinces, distinguishing those which have provided for their own vaccination sufficiently, insufficiently, or not at all.

Sufficiently.	Insufficiently.	Not at all.
Boolundshuhur.	Saharunpore.	Meerut.
Anoopshuhur.	Bareilly.	Ghazeeabad.
Khoorja.	Sumbhul.	Barote.
Coel.	Agra.	Baghput.
Hattrass.	Furruckabad.	Shahdera.
Secundra Rao.	Muttra.	Deobund.
Hurdwagunj.	Cawnpore.	Hurdwar.
Atrowlee.	Benares.	Beesulpore.
Mussoorie.	Mirzapore.	Futtehpore Sikri.
Dehra.	Azimgurh.	Sirsa.
Rajpore.	Ghazeepore.	Bharutgunj.
Pillibheet.	Goruckpore.	Chunar.
Moradabad.		Bulliah.
Chundowsee.		Jhansie.
Dhunourah.		Mowakneepore.
Amroha.		Calpee.
Shahjehanpore.		Koonch.
Bijnour.		Almora.
Nugeena.		Nynee Tal.
Nujeebabad.		
Dhampoor,		
Chandpoor.		
Budaon.		
Bilsee.		
Oojhanee.		
Ferozabad.		
Etawah.		
Mynpoory.		
Kasgunj.		
Etah and Soron.		
Brindabun.		
Kosee.		
Julleysur.		
Allahabad.		
Banda.		
Jounpore.		
Oorai.		
Lullutpore.		

As soon as I receive replies from those municipalities who have made insufficient or no provision for their own vaccination, I will communicate the results to His Honor. It is possible that some municipalities may have their own private arrangements, with reference to vaccination, unknown to me (in fact, I believe Meerut has some such scheme of its own), but I am so strongly impressed with the conviction that vaccination should be a separate State department, conducted only by trained and skilled men, servants of, and alone responsible to, the Government for their acts, that I trust His

Honor will deprecate any such private arrangement, and direct that the vaccinators so engaged should be brought under the sole control of the Vaccine Department during the vaccine season.

Nothing can conduce so much to the spread of vaccination as the active co-operation of Magistrates, Civil Surgeons and members of Municipalities in persuading the people to accept the vaccinator's services, searchingly looking into the vaccinator's work, and reporting the results of their investigations to the Superintendent of the Circle (where any communication is desirable); but beyond this their control is not expedient, for authority cannot be divided.

The system now in vogue has proved itself fully adapted to meet the requirements of the people, and needs only to be extended to its full limits to answer every expectation. I trust that no amateur theories, so much the fashion of the time, will be allowed to uproot the present system, which is now beginning to bear the fruit of the labour of so many years.

9. *Municipal Vaccinators and Apprentices.*—It having been ruled by His Honor the Lieutenant-Governor that the services of municipal vaccinators should be utilised during the non-vaccine season, (instead of remaining at their homes on half pay, as is now the case with the Government Vaccine Establishment) orders have been issued placing them at the disposal of the Municipalities from the 15th April to the 15th October for any duties that they may think proper to assign them. This new arrangement has necessitated a prospective remodelling of the Vaccine Department.

When the present system of vaccination (superseding the old dispensary system) was introduced in the year 1854, its operations were confined in the first instance to Rohilkhund, and from that division it was gradually extended over the entire North-Western Provinces, Rohilkhund forming the training ground and centre from which all the establishments were disseminated. As long as these men were permitted to return to their homes during the non-vaccine season, they were content with their position and half-pay, but, now that

the conditions of their service are altered, it has become necessary to replace them with local men, and with this view I applied that an apprentice, an inhabitant of the Zillah, might be attached to each Native Superintendent (since sanctioned) in order that a trained local man might always be ready to step into any vacancy that might arise. In time the entire establishments of the Zillah (Government as well as Municipal) will thus become composed of local men only. The system will have its advantages in the local men being more conversant with the localities and the feelings of the people, and will therefore thus tend to advance the spread of vaccination. The disadvantage is, that there is only a smaller circle from which to select efficient men.

The apprentices will, as a rule, be taken from the Inoculator, Hukeem and Baid class, so as to enlist their sympathies in our favour; and also, as a matter of justice, so as in some measure to compensate them for the inroads that we are making upon their means of livelihood.

10. *Employment of Government Vaccine Establishments during the non-vaccine season.*—This subject is now under the consideration of the Government. Dr. Pringle, Superintendent of the Agra and Meerut Division, suggested some months ago the advisability of Native Superintendents remaining within their Zillahs during the months that small-pox is generally epidemic (April, May, and June) with a view to testing the effect of the vaccinator's work and eliciting all such information as was desirable for the European Superintendent to possess. This suggestion has opened up the still larger question, *viz.*, the utilising the services of the vaccinators also, and has been sent to me for an expression of my opinion. I think the object a good one, but to carry it out it will involve a large pecuniary outlay, as it will be necessary to put the entire establishments on full pay, at least during the period employed, which outlay, to my mind, would be better spent in entertaining more vaccinators, in lieu of collecting statistics likely to prove more curious than reliable.

Anyhow, I am decidedly of opinion that it is premature to adopt any plan of utilising the services of the Native Superintendents and vaccinators in attending, as proposed, during the recess, upon those attacked with small-pox, and in visiting the villages with a view to testing the truth of their own returns, until the Vaccine Department has been placed upon a satisfactory basis; that is to say, not until the entire North-Western Provinces has been occupied by a staff of vaccinators in the proportion of 1 vaccinator to 50,000 persons, and that staff composed of local men for each Zillah. The proportion of vaccinators above given will be sufficient to protect all the new births, and every village will then have the option of vaccination offered to it, which it has not now. It will only require to double the present establishments, and the increase of cost would be, in round figures, not more than Rs. 50,000. The grand total cost of the Vaccine Department would not even then reach to Rs. 1,50,000 per annum, not an extravagant sum to pay for the lives of 9,00,000 annually made safe against the ravages of small-pox—a charge per head not one-seventh of what the Government in England gives, and that in a country where vaccination can be carried on the whole year round.

I do not attach much importance to any arrangement for providing medical treatment for those labouring under small-pox, as suggested by Dr. Planck, Sanitary Commissioner, for the village native mind, as at present constituted, permits only of religious ceremonies being performed over the patient, and craftily devises plans for getting a donkey to the bedside, enticed thereto by a basket of grain, which, if he is wise enough to approach sufficiently near to eat, the evil spirit inhabiting the patient avails itself of that favourable opportunity for a change of residence; preferring, it is believed, a healthy asinine to a pustular human home.

Isolation of the patients, however, might be carried out with advantage.

11. *Custody of Vaccine Village Records.*—The essence of the check upon falsification of returns is the record prepared

in the village or mohulla by the vaccinator. In this record are put down the names of the children vaccinated with the results of the operation. This record is open at all times to the inspection of the Superintendents of Vaccination, the Magistrates, or any one else who is interested in the matter, and, on comparison with the entries in the vaccinator's diary, the truth or otherwise is unfailingly elicited. But difficulties have arisen as to with whom the record should be deposited. Some Magistrates say the chowkeedar or lumberdar; others the putwaree or tehseeldar. I therefore ask the definite orders of the Government on the subject. I myself am of opinion that the tehseel is, under all the circumstances of the case, the most convenient and securest place of deposit. Chowkeedars and lumberdars have no proper and safe place for keeping papers; besides chowkeedars and lumberdars die. Putwarees do not exist in every village; any are seldom or ever to be found at home; so that all things combined I think the tehseeldar the best person to be the custodian. When the Superintendent comes on his tour of inspection he must procure from the tehseel the records of such villages as he intends looking at; the same course must be pursued by the Magistrate or any other civil authority wishing to investigate. It will not be so convenient as if kept in the village itself, but there appears to be no other practicable mode, and any inconvenience is better than the risk of the record being destroyed or not available whenever required.

I therefore hope His Honor will give the necessary permission for tehseeldars to receive and take care of these records in a safe place, but to be always held available of access. I would at the same time ask that orders may be issued that chowkeedars and police are to receive, and forward on to the tehseel, all service covers from the vaccinator in their respective Zillahs, as much time is now wasted in the vaccinator having to trudge into the tehseelee himself with his returns which chowkeedars and police have now been empowered to take over from him.

12.—*English system of Vaccination.*—Whilst at home on furlough, I investigated the system of vaccination in Eng-

land, and was so impressed with the superiority of the principle of our own that I addressed a letter to the chairman of the Committee upon vaccination, then sitting at the House of Commons, offering to give my evidence. I mentioned who I was, and gave all particulars necessary to enable him to form on opinion as to whether my evidence was worth calling for, but as I received no reply whatever to my letter, I conclude that any evidence I might have afforded was considered only of Indian, not English value.

However, as I think differently, I will now place my views on official record, and point out what I consider *the blot* of the English system.

This system consists in making the obtaining of vaccination as inconvenient as possible to the people. Vaccine stations are appointed often one or two miles or more away from the people's homes, and mothers are requested to bring their children, under penalties, at a particular hour to be operated on. The child, if a primary case, must be under 3 months old. It is thus not difficult to account for the 8,000 deaths from small-pox in London alone last year, when mothers are requested to bring out their infants into the pitiless cold and wet of an English winter to a distant vaccine station, there to be detained for hours, and with perhaps no one to look after the other children left behind at home during her absence. The consequence is, they prefer to let their children go unvaccinated, and take the chances of swelling the small-pox columns of the Registrar-General's Returns.

In India the principle is to take vaccination to the homes of the people. The system in the North-Western Provinces is in its infancy; we are crippled in our efforts for want of money, and the services of a solitary vaccinator for each tehseel cannot reach far; but I am convinced that our principles are right, and would be sorry to see them changed, for they have proved themselves by large experience to be sound, and, what is more to the point, successful. I will here sketch what that system is. To every tehseel in the North-Western Provinces

is posted a vaccinator; his duties are to proceed systematically from village to village in one onward direction, vaccinating as many as he is able during the vaccine season. At the time of performing vaccination in a village, he has to enter in a return the *names* of the children operated upon, together with all particulars as to age, sex, parents' names &c.,; and seven days afterwards, he revisits the village, inspects the arms, and records the results in the return, which is then deposited with the headman of the village or the tehseeldar of the District to be kept as a record. All these daily proceedings are, moreover, entered in the vaccinator's diary.

To every Zillah is appointed a Native Superintendent; he has himself been a vaccinator, and consequently is acquainted with all the details of the system, and has been promoted to the position for proved good conduct, zeal, and efficiency. To him is relegated the duties of supervising the work of all the vaccinators under him, and he is held responsible for the correctness of the vaccinators' returns. To every two divisions is appointed a European Superintendent, a medical man; he has the control of the staff under him, and on his tours of inspection devotes his particular attention to the character of the vaccine virus, the truth or otherwise of the returns (which is readily ascertained by comparing the village record with the vaccinator's diary) not only for the present, but for previous seasons, and in influencing the people generally on behalf of vaccination. Over the whole is placed a Superintendent-General who is responsible for the entire working of the system, and maintaining it in a high state of efficiency. In the North-Western Provinces the Superintendent-General has also (with the assistance of a Deputy Superintendent) the charge of *two* Divisions, and the Vaccine Depôt in the Hills. I am of opinion that this system might be imitated with advantage in England. There is no necessity whatever for the actual operation of vaccination being performed by a medical man; all that is needed is that the operator should be *trained*, and any intelligent neat-handed man who can read and write is fitted for the post, (a

small salary of £1 or 30 shillings a week would suffice) and with due arrangements as to area and population, the sphere of a vaccinator's and Superintendent's duties could be readily fixed, and I feel sure that the system would not only work far better than their existing one (which bears failure on its very face), but would be also more economical.

There is a tendency to believe that everything in England is far ahead of what we are doing, or even capable of, in this country; the experience gained by my visit there has led me to opposite conclusions.

2.—*Reply of* GOVERNMENT TO SURGEON-MAJOR F. PEARSON, *Superintendent-General of Vaccination, North-Western Provinces (No. 2523a).—Dated Nynee Tal, the 13th July*, 1872.

I AM desired to acknowledge the receipt, on the 17th June, of your report on the operations of the Vaccination Department for the year 1871-72. The report is dated the 29th April, and is understood to have been delayed in the Press.

2. The returns of vaccination show steady and continued progress. The work done in the Native states of Bundelkhund, which are not properly a portion of the North-Western Provinces, has been rightly excluded from the statistics; but it would be well if you in future added a paragraph to your report in which an account of this work (as well as of the work in the principality of Rampore) should be given, in so far as it is conducted under the supervision of your department. Excluding it, and the figures for Ajmere, the number vaccinated was 322,887, against 291,762 in the year before—an increase of 31,125, or 10·7 per cent. The proportion of successful operations was 87·8, or 2 per cent. higher than last year, when it was 85·7. The total cost of the department was Rs. 82,317-10-0 (against Rs. 80,989 last year), and the cost of each successful operation fell from Re. 0-5-3 to Re. 0-5-0. The only unfavourable feature is the decrease of the work done per mensem by each vaccinator, which fell from 239·2 to 221.

3. The following table shows the manner in which the work has been distributed over each of the four circles into which the department is divided:—

Circle.		Total number vaccinated.	Primary.				Secondary.				Percentage of successful (primary).	Percentage of successful (secondary).	Population of each circle.	Number vaccinated per 100 of population.
			Successful.	Unsuccessful.	Unknown.	Total.	Successful.	Unsuccessful.	Unknown.	Total.				
Kumaon and Rohilkhund,	1871-72,	1,22,277	1,01,977	11,534	7,028	1,20,539	998	599	141	1,738	89·83	62·49	58,00,603	2·10
	1870-71,	1,06,577	86,055	11,108	5,436	1,02,599	1,220	1,928	830	3,978	88·56	38·75		1·83
Agra and Meerut,	1871-72,	96,646	81,670	8,253	6,723	96,646	...	...	...	...	90·8	...	92,64,114	1·04
	1870-71,	87,836	72,239	8,947	6,650	87,836	...	...	...	...	88·9	...		·94
Allahabad and Jhansie,	1871-72,	59,097	42,193	9,865	6,101	58,159	608	273	57	938	81·50	69·01	66,34,763	·89
	1870-71,	53,677	35,245	11,757	6,352	53,354	199	78	46	323	74·9	71·8		·80
Benares,	1871-72,	44,867	36,074	4,875	2,875	43,824	745	127	171	1,043	88·1	85·4	80,05,428	·56
	1870-71,	43,672	35,672	4,462	2,403	42,537	816	269	50	1,135	88·96	75·20		·54
Total,	1871-72,	3,22,887	2,61,914	34,527	22,727	3,19,168	2,351	999	369	3,719	88·4	70	29,704,908	1·08
	1870-71,	2,91,762	2,29,211	36,274	20,841	2,86,326	2,235	2,275	926	5,436	86·9	49·5		·98

There has been an increase in the number vaccinated in every circle, most of all in Rohilkhund and Agra, and least in Benares. The percentage of success has improved in every circle except Benares, which has slightly retrograded. But Allahabad is still by far the lowest in this respect.

4. The number of vaccinators was 244 in 1870-71, and rose to 272, exclusive of "Omedwars," in the present year. Of the increase, two are Government vaccinators appointed in Kumaon, 16 are paid by Municipalities, and 10 by local subscriptions or private charity. This increase is highly encouraging, and testifies both to an enlightened liberality on the part of the donors, and to a growing appreciation of the benefits conferred by your department.

5. The 28 local vaccinators are thus supported :—six by Bhabur and Terai Local Funds, one in Bareilly by subscriptions, four by the Rajah of Tehree in Gurhwal, five by Local Funds of towns in Moozuffernuggur, six by similar funds in Humeerpore, three by the Rajahs of Rampoora, Gopalpore, and Jugummunpore in Jaloun, one by local subscriptions in Azimgurh, and two in Benares by the Maharajah of Vizianagram.

6. No mention is made of the progress of vaccination in the State of Rampore. I am to draw your attention to Section IX. of the Agent's Report, published at page 229 of the Annual Administration Report of the North-Western Provinces for 1870-71. It is there stated that vaccination had been experimentally introduced into one pergunnah in that year. You should enter into communication with the Lieutenant-Governor's Agent, and through him offer your assistance to His Highness in organising and supervising the work of the Department, and you should embody the returns of his vaccinators in your general statements.

7. The 58 Municipal vaccinators are maintained by 49 Municipalities, and the Lieutenant-Governor notices with plea-

sure the manner in which nearly all Municipal Committees have come forward to comply with his wishes in this respect. You mention 19 Municipalities that do not maintain vaccinators. On this subject you will be separately addressed. It is sufficient to say here that some of them have been only just started, others no longer exist as Municipalities, and the rest have mostly entered funds for the pay of a vaccinator in their Budgets for the current year.

8. In the Government review of last year's report attention was drawn to the importance of comparing the work done by different classes of vaccinators. The hint has not been followed up by you, and the figures needed for such a comparison have been put together in this office. The following table shows the number of each kind of vaccinators, the number of operations performed by each class per mensem, and the percentage of success :—

Division.	Class of Vaccinators.	Number of men.	Number of operations per month.	Percentage of successful.
Kumaon,	Government, ...	14	403	94·7
	Local, ...	6	307	92·2
Rohilkhund,	Government, ...	28	391	89
	Municipal, ...	18	233	83·7
	Local, ...	1	63	77·5
	Omedwars, ...	20	107	85·6
Meerut,	Government, ...	26	229	91
	Municipal, ...	12	211	88·9
	Local, ...	5	58	81·5
	Ditto, in Tehree, ...	4	444	92·6
Agra,	Government, ...	35	187	90·3
	Municipal, ...	13	167	93·6
Allahabad,	Government, ...	43	182	80·8
	Municipal, ...	6	161	82·4
	Local, ...	6	161	81·7
Jhansie,	Government, ...	12	137	79·7
	Municipal, ...	3	83	88·1
	Local, ...	3	60	73·5

Division.		Class of Vaccinators.	Number of men.	Number of operations per month.	Percentage of successful.
Benares,	*a*	Government, ...	29	268	87·7
	b	Municipal, ...	6	149	83·7
		Local, ...	2		
Total,	*a*	Government, ...	187	246	88·5
	b	Municipal, ..	60	189	86·8
		Local, ...	25	205	88·9
		Omedwar, ...	20	101	85·6
General Total, ...			292	221	87·8

In Kumaon the locals do less work, and less well, than the Government men, but they work at the foot of the hills, while the Government vaccinators practise in Kumaon itself and can carry on work nearly all the year round. In Rohilkhund there is a very striking difference: the Municipal vaccinators do far less work, and do it less well, than the Government men. In Meerut, Municipal are inferior to Government vaccinators. The local men at Moozuffernuggur were specially unsuccessful (this will be noticed again further on), and the Tehree, like the Kumaon vaccinators, work in the hills all the year round. In Agra and Allahabad the Municipal have done less work, but have done it better than the Government men. In Jhansie the Municipal vaccinators have done very little work indeed, and the locals less. In Benares the figures are not given in the full detail that is required, but the Municipal and local men together fell very far short of the work done by the Government vaccinators.

9. These facts are calculated to excite considerable surprise. It might have been supposed *primâ facie* that the town vac-

a.—Includes one local at Sugree, figures not shewn separately.
b.—Includes two locals at Benares, ditto disto.

cinators not having to travel from village to village, but finding their subjects collected close to their hand, would have performed more operations than those who itinerate through the Tehseel. It might also have been hoped that in the Municipalities where public opinion is sufficiently enlightened to support a vaccinator, it would have been enlightened enough to persuade the people generally to bring their young children to be protected from the scourge of small-pox. In towns, too, the support and influence of officials, and the supervision of the Civil Surgeons might have been expected to produce a marked effect. On the other hand, it is possible that with people in large masses it is less easy to influence opinion than by taking the rural villages in detail, where the residents are often found to be simple and open to conviction. It is possible, too, that the supervision of your department may have been less zealous, the Native Superintendents not feeling the same responsibility as for the work of the Government vaccinators, who are exclusively under them.

10. I am to request your most careful attention, and that of your Superintendents, to this question, and His Honor hopes that the subject will be fully enquired into during the next cold weather, and elucidated in your report. A copy of these remarks will also be forwarded to all Civil Surgeons and Presidents of Municipalities, who will, His Honor trusts, exercise a vigilant supervision over the operations of the Municipal Vaccinators.

11. Another remarkable feature in this table is the steady decrease in the number of vaccinations performed by each vaccinator as one looks down the list in paragraph 8, except Benares. The Rohilkhund tale of work is much larger than that of Meerut, Meerut stands higher than Agra, Agra than Allahabad, and Jhansie lowest of all. This has often been remarked on before, and partial explanations have been given which cannot be called satisfactory. That Bundelkhund with its rude and sparse population should be most backward is natural enough. Equally natural is it that vaccination should

be most popular in Rohilkhund, its first home in the plains. But the reasons why Benares, where vaccination contends with inoculation for popularity, and Meerut, should be higher than Agra, and why Allahabad should stand lowest of all the older and more civilised Divisions, have yet to be sought out.

12. A third and novel feature in this table is the appearance of "Omedwars," *i.e.*, working candidates or apprentices. Their work is separately shewn in Rohilkhund only, and was never shewn there till this year. In Benares they are certainly employed (and are, it appears, paid for each successful operation they perform); but they probably are entertained everywhere. Their position should be clearly recorded, their pay stated, and their work separately shewn. You speak of them in one place as having been abolished, but in another passage you rightly say that a regular system of entertaining local apprentices has been approved by Government. Their entertainment seems at present to be a necessity, for only in this way can men be trained up to acquire the necessary skill as successful operators, and as far as possible every district should in time be supplied with a body of trained vaccinators, working in the places where they were born and are known, and where they prefer to remain.

13. Another point to which your attention should be drawn is the proportionate age at which vaccination is performed.

	Under one year	Over one year.	Percentage	
			Under.	Over.
Kumaon, ...	27,692	8,620	76·26	23·74
Rohilkhund, ...	25,991	58,236	30 86	69 14
Agra and Meerut, ...	31,276	65,370	32·37	67·63
Allahabad, ...	18,744	39,415	32 23	67·77
Benares, ...	4,560	39,264	10·41	89 59

Of the 3,19,168 primary operations of the year, only 34 per cent. were performed on children under 1 year old. In the previous year the percentage had been 30. But it will be seen from the figures in the margin that the proportion varies much in different divisions and circles. In

Kumaon alone the vaccination of children naturally preponderates greatly, and this is the normal state to which every division should reach, when protection is so nearly complete, and confidence in the prophylactic so well established as it is in Kumaon. In Benares, on the other hand, the proportion is vastly less than elsewhere, and efforts should be made to ascertain the reason why the operation is so seldom performed there on young children.

14. The Inspector-General of Hospitals, in his report on the Lunatic Asylums, Vaccination, and Dispensaries for 1870, dwells on the valuable and important results that would flow from a "vaccine census," of schools and jails, that is, an inspection of the prisoners and scholars to see how many of them were protected by vaccination or by having had small-pox, and how many were unprotected. The Lieutenant-Governor considers the suggestion one that might possibly lead to valuable results, and would desire you to enter into communication with the Inspector-General of Jails and the Director of Public Instruction in order to ascertain whether there would be any objection to such an inspection, and whether the information could be readily and accurately recorded. By a repetition of it at intervals, and by a comparison of the results, a sound method of ascertaining the progress of vaccination in the Province might be secured. But, specially in the village schools, it would be necessary to avoid anything in the inspection that might occasion distrust or suspicion of our motives—feelings with which the people are always too ready to view our efforts in respect of vaccination.

15. The deaths from small-pox recorded in the year by the Mortuary Registrars were 37,994, an increase over the year 1870-71, when they were only 23,564. The districts where most deaths occurred are shown in the margin. No other district rose above 1,000 deaths. April, May, and June were the worst months, and May was

Bijnour,	...	6,881
Moradabad,	...	4,406
Bareilly,	...	4,257
Shahjehanpore,	...	3,506
Saharunpore,	...	4,896
Moozuffernuggur,	...	4,006
Budaon,	...	1,245
Meerut.	...	1,183
Cawnpore,	...	1,146

the most fatal of all. This is a point which ought specially to interest Superintendents of Vaccination, who should record in their reports the localities where the epidemic was most widespread, and should try to ascertain its immediate cause, and whether it can be connected with any weakness of the protecting establishment, or any special unwillingness of the people to accept the prophylactic. Dr. Pringle is the only Superintendent who has at all met the Lieutenant-Governor's wishes in this respect.

16. The Lieutenant-Governor does not object to your proposal to record low caste Hindoos separately from higher castes, but in reference to this I am to draw your attention to letter No. 10-247,* dated 12th June, 1872, from the Secretary to Government of India, Agriculture, Revenue and Commerce Department, and to request you to communicate with the Sanitary Commissioner in order to secure uniformity of classification.

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* "No. 10-247, dated Simla, the 12th June, 1872.

"*From*—THE SECRETARY TO THE GOVERNMENT OF INDIA, *Department of Agriculture Revenue, and Commerce (Statistics).*

"*To*—THE SECRETARY TO THE GOVERNMENT, *North-Western Provinces.*

"SIR,—The replies received to this office Circular No. 158—167, dated "the 21st October, 1871, shew that the system of classification adopted in the "registration of deaths varies in different provinces. In some of them meh-"tars chamars, and other low castes have been entered as "Hindus;" in "others these have been included under "Other Classes."

"2. On this point it does not seem to be advisable to lay down any one "rule for general adoption in all parts of the country. But, whichever "mode of procedure be adopted, I am directed to request that the follow-"ing points may receive attention :—

"*First.*—The same system of classification should be observed through-"out the whole of each province. It appears that in "some districts one method is followed, while in other "districts under the same Government a different prac-"tice obtains. Throughout each province there should "be complete uniformity.

"*Secondly.*—In preparing the annual statement of mortuary statistics "No. V., shewing deaths registered according to classes' "the results of registration as given in the sub-divisions "of columns 5 and 6 should be framed on the same prin-"ciples as the details of the population shewn in the "sub-columns of No. 4.

"*Thirdly.*—A foot-note should invariably be added to this statement "No. V. to explain what system of classification has been "adopted and what castes or races are included under "'Other Classes.'"

17. Your attention is requested to the irregularity of the figures regarding secondary operations, and some explanation should be given concerning it. Dr. Pringle does not record a single one in his whole circle, nor did he record one last year. In the other circles great discrepancies exist. In Rohilkhund only 5 men out of 47 performed any; in Allahabad 24 out of 73; in Benares 4 out of 37. It seems more likely that there is a variation in the manner of recording these statistics than that the conditions under which the operation is performed should be so exceptional.

18. The table in the margin shows the month in each circle in which the greatest number of operations was performed, and the greatest measure of success obtained. Can any explanation be given of the cause of variation, especially in the case of Benares?

	Month in which most operations were performed.	Month in which greatest success was obtained.
Kumaon, ...	February,	January.
Rohilkhund, ...	January,	January.
Agra and Meerut, ...	January,	December.
Allahabad and Jhansie,	January,	December.
Benares, ,,	March,	November.

19. His Honor notices with commendation the zealous care which all the Superintendents have taken to test the vaccinators' returns, and to secure accurate statistics of work done. Some cases, however, are noticed in the margin, where the number of operations recorded seems suspicious, either for its absolute or for its relative greatness. In each of these cases the Tehseel is out of the way, and may not have been inspected by the Superintendent. In Budaon the average is 529, and if the Goonour vaccinator really exceeded it so greatly, securing also a percentage of success of

District.	*Tehseel.*	*Number of operations per mensem.*
Budaon,	Goonour,	... 750
Allahabad,	Mejah,	... 441
Lullutpore,	Mehronee,	... 318
Goruckpore,	Pudrona,	... 458
Mirapore,	Robertsgunge,	... 670
Ghazeepore,	Russera,	... 530

96·31, he worked exceptionally well. In Allahabad the Mejah man apparently did nearly four times as much as the average of the district, which is 122. In Lullutpore, while the vaccinators in the town and the Sudder Tehseel did 79 and 104 cases each, the Mehronee vaccinator, in the most out of the way part of the district, records 318. The same remarks apply to Russera and Pudrona. In Mirzapore, while in the city and the thickly populated northern parts the highest number of operations was 236 per mensem, we are asked to believe that a vaccinator in the wild and thinly peopled parts around Robertsgunge vaccinated 670 people a month. Dr. Richardson does indeed specially refer to his success, and accounts for it by saying that the vaccinator is a wealthy zemindar, and was aided by his brother; but he does not report that he visited the tehseel, or personally inspected his work.

20. The work done by the Kumaon and Gurhwal Vaccination Depôts has been highly valuable, and the Lieutenant-Governor concurs in your remarks on the purity and efficiency of the virus stored there, and distributed thence not only to the North-Western Provinces, but to all parts of India.

21. The subject of the employment of vaccinators throughout the twelve month has been much discussed during the year. Municipal vaccinators are the servants of the Municipality, (under the general supervision of the Superintendent of the Circle) and are generally employed in the Dispensaries during the hot weather and rains. Government vaccinators have hitherto been allowed to go to their homes during the recess, and you represent that so long as they are not residents of the Districts where they work, the withdrawal of this permission would certainly be followed by their resignation. His Honor has accepted the force of this argument, but has directed you to do all in your power to train up operators from every district: they, working within their own districts, would not require a holiday to visit their homes, but could be utilised all the year round in any work they are fit for. This is a better remedy

than that of increasing the pay, as proposed by you in your 10th para.

22. The Lieutenant-Governor is glad to read your testimony to the assistance rendered you by Magistrates and other District officials in inspecting and testing the work done. The present orders are that the vaccinators' record of operations should be left with the Lumberdar of the village. You think they will be more accessible if left in the tehseel and treated as a Government record. His Honor doubts if this would be a successful plan; but the opinion of the Board of Revenue will be taken on the subject, and the most experienced District Officers consulted.

23. The failure of the attempt to entertain local vaccinators in Moozuffernuggur, paying them out of the town funds, is noticed with regret. It would probably have been better not to have restricted their operations to the towns themselves; if extended to the neighbourhood, they might have become more popular, and in that case the charge might have been shared between the town funds and those of your department.

24. Dr. Richardson's remarks on the difficulties which attend our attempts to make inoculators give up their own craft and take to vaccination are sensible, and have been read by His Honor with approval. The more riskful remedy seems to an ignorant people the more effective; and the inoculator is looked on as a man who heals a difficult and dangerous disease. Possibly also the inoculator has an advantage over the vaccinator in being able to practise his craft in the hot season, when small-pox is most prevalent and most dreaded. But whatever the difficulties are they should not discourage the officers of your department from continuing their efforts to convert this class of men, who may be as useful as they now are dangerous to society.

25. I am also to draw attention to Dr. Richardson's remarks on the use to which he has put his box of medicines

and instruments. If the field-hospital panniers he asks for are easily procurable, they should be supplied to all Superintendents.

26. The Lieutenant-Governor observes that you have not adverted in your report to the experiments made with animal vaccination. The information given by Drs. Richardson and Watson is not very conclusive; but as far as the experiments go, no absolute superiority over the ordinary lymph seems to be established; and there is a suspicion that the virus does not keep as well. The difficulty of the operation and the odium incurred by native operators are additional weights in the adverse scale. A panic caused by any supposed outrage of the prejudices of the people might throw back our endeavours and materially injure the case.

27. His Honor is gratified to see the number of Native gentlemen and officials who are reported to have done good service by assisting in the spread of vaccination, and authorises you to convey to each of them expressions of his approval.

28. In conclusion I am to express the Lieutenant-Governor's satisfaction with the results recorded in this year's report. His Honor welcomes you back to a post you have so long and so honourably held, and commends the care and ability with which Dr. Watson discharged the duties of the office during your absence. The Superintendents, Drs. Pringle, Watson, Milne, and Richardson, have shewn their usual devotion to their duties, and are congratulated on the efficient state to which they have brought the department. Improvement is visible in all branches of the work, and, though not rapid, is steady and sure.

Art. XIX.

REPORT ON THE METEOROLOGY OF THE NORTH-WESTERN PROVINCES FOR 1871.

1.—*From* Reporter on Meteorological Observations, *to* Secretary to Government, *North-Western Provinces*, (*No.* 93).—*Dated Roorkee, the* 1*st April*, 1872.

I have the honor to submit the annual report on Meteorological Observations taken in the North-Western Provinces during 1871. On the 12th of February last I took over charge of the Meteorological Office from Professor John Elliott, who had officiated for me while I was absent on sick leave, from the 16th of January, 1871.

Number of Stations.—Observations, more or less complete, were sent from fourteen stations during the year. What is called a complete set of observations includes a register of the barometer, standard, dry and wet-bulb thermometers at 4, 10, 16 and 22 hours of every day; and also once a day the readings of the self-registering thermometers, of which there are four: the maximum solar, and minimum terrestrial radiation, and the maximum and minimum-in-shade, as well as the reading of the rain and wind gauges. In addition to these the amount of cloud in the sky and general weather is recorded four times in each day of 24 hours.

Although this is the daily amount of work aimed at, I regret having to report that it is not achieved in all the fourteen stations; a number of gaps in the registers occur, most frequently arising from the want of a complete set of instruments. Very great difficulty is experienced in replacing useless or broken instruments. The only means there is of doing this, with any degree of expedition and moderate cost of carriage, is to send the instruments by *banghy post*, and, notwithstanding all the

efforts that are made to secure their safety by careful packing, about a third of all the instruments sent arrive at their destination broken, or irreparably damaged.

Inspection of Observatories.—Mr. Elliott visited all the observatories except Raneekhet; a full report of this tour has already been made to Government in No. 36 from this office, dated the 30th of January, 1872.

Supply of Instruments.—During the year the following instruments were received from the Mathematical Instrument Depôt at Calcutta:—5 barometers (mountain), 2 dry and wet-bulb thermometers, 6 maximum-in-shade thermometers, 3 minimum-in-shade thermometers, 19 maximum-in-sun's-rays thermometers, 10 minimum-on-grass thermometers, 12 terrestrial radiation maximum thermometers, and 1 wind-vane.

Hourly Observations.—Another series of hourly observations was made at Roorkee at the periods of the spring and autumn equinox, and the summer and winter solstice. The results of these, along with those of former years, are given in a table forming Appendix C.*

These observations were fully commented on in the last annual report, and there is hardly anything further to say upon them this year, except to repeat that the largest diurnal barometric-wave occurs in the daytime, having its crest occurring from 10th to 12th hour, and its hollow from 16th to 17th hour. When the different seasons of the year are compared, it is seen that this diurnal wave is greater in the spring equinox than in the autumn one, and greater in the winter than in the summer solstice. In other words, it is greater in the cold than in the hot weather. It may be further added that the greater diurnal wave occurs at the time of the year when the air pressure is greatest, and therefore when the bulk of atmosphere over the place of observation is at its largest.

Meteorological Instruction in the Agra Medical School.—The annual course of instruction in the rudiments of meteor-

* Not printed.

ological science, and the mode of using meteorological instruments, was given as before in the cold weather by Meer Altaf Ali, the Observer at Agra. Meteorology is not one of the subjects which is compulsory in the education of a Native doctor; the attendance, therefore, on this course of instruction is quite voluntary; some inducement, however, is held out in the shape of a money prize which the Government was pleased to sanction three years ago. So as to enable them to compete for this prize, a few students attend the course, but in a very irregular manner. The prize is settled by an annual examination, which is conducted by the Reporter on Meteorology. The attendance on the course, and the knowledge gained by the students in 1871, was a great improvement on that of 1870. Twenty-two students competed, the average of whose marks was 37 per cent. of full marks. The amount of the prize was divided into a first, second, and third prizes. The gainer of the first was Zahur-ood-deen, who got 75 per cent. of full marks; the second and third prizes were respectively gained by Boolakee and Ramzan Ali, whose marks were 66 and 62.

Barrack Temperature Registers.—The Sanitary Commissioner with the Government of India called for observations on the temperature of the rooms and verandahs of the European soldiers' barracks which had been recently built at certain stations, and also of the old barracks at the same stations. It was arranged that these registers should be sent to the Reporters on Meteorology in the various provinces in which these stations were situated for the purpose of being examined, and a somewhat undue share of these was directed to be sent to this office. The register, as at first drawn up, was a very elaborate one, and I pointed out at the time that it would hardly be possible to get it filled up with any degree of trustworthiness. Recently it has been much simplified. The registers sent to this office were duly examined and commented upon, and the results, as had been arranged, were reported to the Sanitary Commissioner, to whom the registers were also directed to be sent.

No copies of these were kept, so that no part of them can appear in this report.

Monthly Reports.—Each month's observations, as received, were examined, the means and totals checked, and a summary of them prepared and published in the *Government Gazette.* Up to August, the tabular matter which accompanied this summary contained the mean air pressure at 10 and 16 hours for six stations—Roorkee, Agra, Lucknow, Goruckpore, Ajmere, and Benares. The mean air pressure of these places was accompanied by the mean pressure for the same months for former years, taking them as far back as they could be considered trustworthy. There were also the mean readings of the various self-registering thermometers, the dry and the wet-bulb, and humidity deduced therefrom at 10 and 16 hours. The figures published for these instruments were the means of all the observing stations, excluding those on the Hills. These readings were also accompanied by the corresponding ones for former years. An improved form of monthly abstract was begun in August, and it is this which now accompanies the summary for each month. Abstracts in this form have been prepared for all the months of 1871, and are published along with their respective summaries in Appendix A.* of this report. The older abstract, including barometer readings for Roorkee, Agra, Lucknow, and Benares, is, however, also published because of its value in enabling a comparison to be made between preceding years and the one now reported on.

Barometer and Temperature Charts.—A barometer and temperature chart for every station is regularly prepared every month, but on account of the expense of printing these they are not published. They are of invaluable assistance in preparing the summary for each month. A series of barometer and temperature charts, in which the monthly means only appear, were printed in the report for 1870, and a similar series accompany this report. It will be seen that an additional

* Not printed.

element has been added to both charts. A dotted line in the barometer charts shows the monthly mean air pressure, and in the temperature charts shaded columns have been put in to exhibit the total monthly rain-fall, each horizontal line in the charts showing half an inch of raise.

Cost of Maintenance of Meteorological Stations.—In the remarks appended by Government to the Report of 1870, a request was made to the effect that the annual report should contain a statement of the expense of these meteorological observations. Such a statement has been prepared, and is submitted in Appendix D*. Data do not exist for a very perfect statement, but now that attention has been drawn to it, a more complete statement may be expected in future years.

This seems the proper place to state that the observatory at Dehra costs the Meteorological Department nothing; both the establishment and the instruments belong to the Great Trigonometrical Survey. The expense of the Lucknow Observatory is, of course, borne by the Province of Oudh; in fact, the observations from Lucknow published in this report are only borrowed from those already published, from week to week, in the Oudh *Government Gazette*. The salaries of the Ajmere Observatory establishment are now paid by the Agency of the Rajpootana States. Instruments, however, are supplied from Roorkee, and in return the monthly registers are sent to the office of the Reporter on Meteorology direct.

In June last, the sanction of Government was obtained to an increase in the salaries of the Native observers, who, up to that time, had been drawing Rs. 15 a month. The salary was to be raised to Rs. 25, and an increase of Rs. 5 a month each year was to take place until the maximum of Rs. 40 per mensem was reached. A special case was made of the Native observer at Roorkee, Sheodyal Singh, whose pay was at once raised to Rs. 40, with the addition of Rs. 10, on account of his having charge of the stock of instruments. This promotion was well merited, as Sheodyal Singh has been observer

* Not printed.

at Roorkee for the last eleven years, and is a very careful, trustworthy man.

Summary of the Weather in 1871.—The months of January and February did not differ greatly from the same months of previous years. The month of March was drier and slightly warmer than usual. The weather of April was likewise normal, but that of May was exceptional: instead of the hot, dry atmosphere, which commonly characterises this month, the air was much cooler and far more moist. The dry, hot westerly winds were replaced by moist south-east or easterly ones. Few clouds are usually seen in May, but in May, 1871, the sky was clouded over for fully two-thirds of the month. The cause of these unusual features was a relative depression of the barometer over the North-Western Provinces compared with that of Bengal. This determined the setting in of the south-east and easterly winds, which are always moist winds in this part of India. This low air pressure continued into June, and determined the early onset of the monsoon rains, which, although usually not well established until the middle of the month, had in this year fully commenced by the 3rd or 4th. This accession of the rains at once modified the fervid heat of the hot weather, replacing it by an atmosphere moister and cooler. There were two periods in the month in which rain fell heavily: these were from the 10th to the 15th, and from the 22nd to the 27th and 28th. The want of air pressure in June was restored in July, which had rather a higher barometer than usual, but as it was also the case in the Lower Provinces, this circumstance did not interrupt the monsoon current. The wind was easterly or south-easterly, the sky was covered with clouds, and rain fell on an average at all the stations on 19 out of the 31 days. This large accession of moisture kept the mean temperature below the average, as it had done in the two previous months. Notwithstanding a slight rise in the barometer in August, and also a change of wind from east to west, the great humidity and cloudy sky prevailed during that month. Rain also fell very heavily in the extreme

eastern districts of Goruckpore and Benares, and in the north-western districts of Roorkee and Dehra, and in the western one of Agra; the intervening tracts had a lower rain-fall than usual. A slightly lower air pressure was observed in September, and easterly took the place of the westerly winds of August, and the moist atmosphere and cloudy sky were still maintained; but the rain-fall, except at Lucknow and Goruckpore, was rather under than over the average, and the mean temperature was much the same as in former years. At the end of September the monsoon wind, which, as before remarked, is in these provinces south-east, changed to a west or north-west, and the rains came to an end. No rain fell in October, but the humidity of the atmosphere continued above the average, possibly from the clear sky and the rapid evaporation which ensued at the termination of the rains, accompanied with a falling temperature. During the first-half of November the humidity was still relatively high, and the wind varied between west and north-west and east and south-east. In the second half of the month the wind was nowhere easterly, and was either westerly or a calm prevailed. The mean temperature fell steadily all through the month. The more agreeable cold weather began with all its usual features in the latter half of November. A change, however, ensued about the 19th of December, the wind went round to east, clouds gathered, and rain fell at all the observing stations. Although the humidity was rather above, the mean temperature was the same as the average.

The more prominent features of the year were, first, the moderation of the greater heat of the hot weather in April and May, especially during the latter month, by a more than usually humid air and cloudy sky, and consequently a lower air temperature; and, secondly, the early onset of the rains along with a large average rain-fall.

REMARKS ON THE AIR PRESSURE, TEMPERATURE, &c., OF 1871, COMPARED WITH PREVIOUS YEARS.

BAROMETER IN ROORKEE REDUCED TO LEVEL OF SEA.

Year.	Jany.	Feby.	March.	April.	May.	June.
1871, ...	30·048	29·944	29·876	29·765	29·662	29·514
1870, ...	30·045	29·963	29·885	29·778	29·561	29·531
1869, ...	30·109	30·044	29·934	29·752	29·560	29·555
1868, ...	30·121	30·199	29·981	29·852	29·799	29·606
Mean, ...	30·081	30·037	29·919	29·787	29·646	29·552

Year.	July.	Augt.	Septr.	Octr.	Novr.	Decr.
1871, ...	29·514	29·575	29·668	29·940	30·077	30·164
1870, ...	29·491	29·578	29·717	29·855	30 015	30·095
1869, ...	29·510	29·581	29·663	29·840	30 066	30·071
1868, ...	29·627	29·636	29·762	29 700	30·060	30·131
Mean, ...	29·536	29·592	29·703	29·834	30·055	30·115

BAROMETER IN MEERUT REDUCED TO LEVEL OF SEA.

Year.	Jany.	Feby.	March.	April.	May.	June.
1871, ...	30·060	29·971	29·909	29·801	29·701	29·557
1870, ...	30·031	29·977	29·910	29·802	29·619	29·586
1869, ...	30·181	30·049	29·947	29·835	29·636	29·502
Mean, ...	30·091	29·999	29·922	29·813	29·652	29·548

Year.	July.	Augt.	Septr.	Octr.	Novr.	Decr.
1871, ...	29·577	29·546	29·621	29·869	30·022	30·167
1870, ...	29·528	29·628	29·745	29·882	30·040	30·089
1869, ...	29·565	29·629	29·701	29·881	30·062	30·061
Mean, ...	29·557	29·601	29·689	29·877	30·041	30·106

BAROMETER IN BAREILLY REDUCED TO LEVEL OF SEA.

Year.	Jany.	Feby.	March.	April.	May.	June.
1871, ...	30·068	29·980	29·916	29·828	29·729	29·578
1870, ...	30·010	29·978	29·910	29·827	29 651	29·632
1869, ...	30·221	30·020	29·931	29·789	29·640	29·495
Mean, ...	30·099	29·999	29·919	29·815	29·678	29·568

Year.	July.	Augt.	Septr.	Octr.	Novr.	Decr.
1871, ...	29·591	29·579	29·649	29·879	30·029	30·115
1870, ...	29·586	29·667	29·793	29·920	30·037	30·102
1869, ...	29·592	29·663	29·744	29·901	30·071	30·053
Mean, ...	29·589	29·636	29·729	29·900	30·046	30·090

BAROMETER IN AGRA REDUCED TO LEVEL OF SEA.

Year.	Jany.	Feby.	March.	April.	May.	June.
1871, ...	30·166	29·967	29·902	29·780	29·672	29·520
1870, ...	30·015	29 955	29·883	29·780	29·608	29·562
1869, ...	30·080	30·011	29·917	29·802	29·625	29·488
1868, ...	30·090	30·014	29·940	29·814	29 735	29·560
Mean, ...	30·088	29·987	29·911	29·794	29·660	29·532

Year.	July.	Augt.	Septr.	Octr.	Novr.	Decr.
1871, ...	29·551	29·542	29·613	29·844	30·004	30·089
1870, ...	29·500	29·602	29·726	29·859	30·009	30·073
1869, ...	29·542	29·617	29·681	29·873	30·060	30·059
1868, ...	29·565	29·602	29·716	29·893	30·025	30·095
Mean, ...	29·539	29·591	29·684	29·867	30·025	30·079

BAROMETER IN FUTTEHGURH REDUCED TO LEVEL OF SEA.

Year.	Jany.	Feby.	March.	April.	May.	June.
1871, ...	31·116	30 031	29·953	29·845	29·750	29·598
1870, ...	30·099	30·035	29·957	29·867	29·688	29·655
1869, ...	30·161	30·075	30·015	29·881	29·739	29·604
Mean, ...	30·125	30 037	29·975	29·864	29·726	29·619

Year.	July.	Augt.	Septr.	Octr.	Novr.	Decr.
1871, ...	29·630	29·607	29·726	29·919	30·073	30·165
1870, ...	29·595	29·700	29·822	29·956	30 089	30·143
1869. ...	29·646	29·722	29·761	29·941	30·133	30·130
Mean, ...	29·627	29·676	29·769	29·939	30·098	30·146

BAROMETER IN LUCKNOW REDUCED TO LEVEL OF SEA.

Year.	Jany.	Feby.	March.	April.	May.	June.
1871, ...	30·075	29·996	29·909	29·828	29·718	29·552
1870, ...	30·045	29·914	29 904	29·812	29·616	29·577
1869, ...	30·144	30·041	29·948	29·804	29·660	29·547
1868, ...	30·115	30·025	29·951	29·814	29·776	29·582
Mean, ...	30·095	29·994	29·925	29·815	29·092	29·565

Year.	July.	Augt.	Septr.	Octr.	Novr.	Decr.
1871, ...	29·574	29·591	29·690	29·869	30·030	30·123
1870, ...	29·532	29·623	29·773	29·889	30·027	30·098
1869, ...	29·600	29·674	29·766	29·896	30·102	30·105
1868, ...	29·590	29·624	29·745	29·936	30·163	30·153
Mean, ...	29·574	29·628	29·744	29·898	30·081	30·119

BAROMETER IN BENARES REDUCED TO LEVEL OF SEA.

Year.	Jany.	Feby.	March.	April.	May.	June.
1871, ...	30·074	29·987	29·907	29·808	29·721	29·548
1870, ...	30·018	29·957	29·871	29·765	29·579	29·551
1869, ...	30·111	30·009	29 920	29·783	29·625	29 505
1868, ...	30·123	30 007	29·926	29·785	29·764	29·571
Mean, ...	30·081	29·990	29·906	29·785	29·672	29·544

Year.	July.	Augt.	Septr.	Octr.	Novr.	Decr.
1871, ...	29·579	29·620	29·668	29·880	30·026	30·081
1870, ...	29·504	29·591	29·700	29·845	30·010	30·082
1869, ...	29·587	29·641	29·688	29·876	30·087	30·075
1868, ...	29 575	29·662	29·715	29·910	30·030	30·108
Mean, ...	29·556	29·628	29·693	29·878	30·038	30·086

In compiling the above tables of barometer means great pains have been taken to correct all errors, instrumental as well as others, but it is feared that inaccuracies still remain.

The chief purpose of the table was an attempt to show differences, if any, between the atmospheric pressure of the years 1868 and 1869, when the rains were deficient, and of 1870, when the rains were in full average, and in 1871, when they were in excessive quantity. The table has not realised the end which was had in view, but this was perhaps what might have been expected, as it is well known that the rainfall of India being due to a cause which is in operation over a very large part of the earth's surface, it would hardly be possible to observe it when looked for in such a limited area as that embraced by the stations named in the table, even although it has an extent of about 400 miles in length and from 50 to 150 in breadth. And yet an examination of the table will show that for the first three months of the years under comparison there was a remarkable difference in the air pressure, which was relatively high in 1868 and 1869 compared with 1870 and 1871. Had this high pressure been continued into the months of June, July, and August, an adequate cause of the short rainfall of the former years would have been established, but the difference in air pressure noticed in January, February, and

March was very much less in April, and almost disappeared entirely in the rain months of June, July, and August. The excess of pressure again appeared in the cold weather months; especially is this the case when 1868 on the one hand, and 1870 and 1871 on the other, are contrasted, and when Roorkee is left out of view.

The positive information which is to be gained from the table is that the fall of the air pressure from its maximum in January to its hot weather minimum in June, or July, is slower than its rise from the minimum up again to its cold weather maximum in December. This may be well seen if a pencil line be drawn on any of the barometer charts which accompany the report so as to connect the centre of each of the monthly means indicated by the dotted lines. The gradient from January to June or July is much less steep than that from June or July to December. This difference is caused by the rapid increase in the air pressure which takes place on the cessation of the south-west and the setting in of the north-east monsoon in the latter-half of October and first-half of November. The great dryness and coldness of the air which the latter current pours down on the plains of India is no doubt the cause of this phenomenon. A confirmation to this appears in the slightly quicker increase which the air pressure suffers from the hot to the cold weather in Roorkee and Bareilly, two stations which are much nearer the Himalayas than the others, and which therefore are the first to be effected by the cold dry current. Beyond this last feature, and which is far from being a prominent one, the table does not exhibit any constant difference in the amount of air pressure at the several stations.

THERMOMETER EXPOSED TO SUN'S RAYS.

Place and year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Chuckrata,... 1871,	124	124	134	133	131	136	116	117	135	133	127	104
Chuckrata,... 1870,	119	122	117	129	135	126	110	120	130	130	126	...
Chuckrata,... 1869,	...	...	118	...	...	133	126	125	126	128	122	118
Roorkee, ... 1871,	110	118	129	138	...	137	128	132	137	132	122	111
Roorkee, ... 1870,	114	122	125	135	144	140	132	136	132	128	120	111
Roorkee, ... 1869,	114	119	133	152	159	154	146	150	147	140	129	114
Meerut, ... 1871,	114	128	141	147	...	...	...	...	143	140	133	120
Meerut, ... 1870,	125	131	142	149	152	148	137	144	140	143	132	120
Meerut, ... 1869,	120	132	137	155	160	154	142	147	139	140	132	124
Agra, ... 1871,	127	142	154	161	158	153	140	139	152	157	148	134
Agra, ... 1870,	135	144	151	160	169	156	156	149	155	154	147	135
Agra, ... 1869,	128	139	148	163	171	162	152	155	151	146	144	135
Futtehgurh, 1871,	122	132	147	155	153	144	132	134	145	147	137	124
Futtehgurh, 1870,	128	134	143	152	155	148	141	137	137	141	137	129
Futtehgurh, 1869,	118	134	146	156	159	154	145	145	138	134	135	124
Lucknow, ... 1871,	114	124	140	152	151	144	140	159	133	139	131	120
Lucknow, ... 1870,	118	127	139	147	157	149	138	134	133	131	125	121
Lucknow, ... 1869,	118	127	137	151	159	153	141	142	139	128	126	118
Jhansie, ... 1871,	120	129	140	150	155	137	131	129	141	...	149	...
Jhansie, ... 1870,	124	133	141	148	156	148	142	138	141	135	133	126
Jhansie, ... 1869,	102	124	137	150	159	155	143	144	146	133	129	121
Ajmere, ... 1871,	108	114	131	144	146	139	127	120	134	135	115	106
Ajmere, ... 1870,	115	120	125	138	147	137	122	116	127	127	125	116
Ajmere, ... 1869,	111	123	132	148	151	147	137	132	126	128	121	116

OBSERVATIONS BY THE SOLAR RADIATION THERMOMETER.

The instrument in use for these observations is of the same construction at all the stations. It is a self-registering black-bulb thermometer, fitted into an outer glass case from which the air is withdrawn. The object of having the

instrument in a vacuum is to prevent any interruption of the heating of the bulb from conduction. These thermometers, as sent out to India, are beautifully made as regards workmanship; but, notwithstanding, they are not without fault; and they are faulty quite distinct from the fact that they are not actinometers as their name solar radiation thermometer would imply. The first imperfection they have is that they very seldom read alike; it is not at all uncommon to see three or four of them exposed side by side, and, under the same circumstances, reading with as many as 7° or 8° of difference. They are usually sent out from their makers with a certificate attached from the Kew Observatory, showing an index-error seldom exceeding one degree. It is said, however, that this error applies to the unmounted instrument, by which I understand when it is without the vacuum case. It must also be said that the comparison with the standard has gone no further than 92°—a maximum point which is far under the temperature these instruments have to record even in the cold weather. Another imperfection is that they sometimes cease to be self-registering. This arises in cases where I have observed it from the extinction of the minute air bubble which separates the upper inch or so of the mercury column from the rest. This is what is called Philip's principle for a maximum self-registering thermometer. This fault may be in existence long before it is noticed. It is easy to test for the fault: if a shade be held over the bulb for half a minute it will not cause the mercury column to sink if the instrument is all right, but it will sink readily if the self-registering principle has ceased to act.

The addition of the vacuum case to a maximum black-bulb thermometer makes a great difference to its indications. I have often watched the exposure of a naked black-bulb and one protected by a vacuum case, and seen the latter rise from 25 to 40 degrees higher than the former; indeed, it is difficult to believe that the large bulb of the vacuum case is not acting the part of a lens and bringing a much larger

number of heat rays to act on the thermometer bulb than should be. This thermometer is exposed from 10 to 16 hours (10 a.m. to 4 p.m.), and read at the latter hour. It is exposed whether the sky is cloudy or clear; that it receives a large amount of heat even through thick clouds may be seen from the means which are recorded during the months of the year when an overcast sky is the rule. These means are far higher than those shown by the maximum thermometer in the shade. Indeed, as long as light rays from the sun penetrate a cloud, the more refrangible of the heat rays will penetrate also.

The table shows means of solar radiation from only one hill station, Chukrata, which is 6,884 feet above the sea. So far as they go, however, these means bring well out the use of this thermometer. Compare the Chukrata means with those of Roorkee or others of the stations on the plains, and the difference is not very great; indeed, the Chukrata means are sometimes the higher of the two, especially in the cold weather months. Now, on a table given farther on, compare the means of maximum-in-shade of Chukrata with those of a station on the plains. It need hardly be pointed out how much lower the former are. The source of the temperature shown by the solar radiation thermometer is directly from the sun at whatever elevation it may be placed, but the thermometer in the shade shows the temperature of the air only. From the experiments of Forbes and Kaemptz it might be expected that the heat of the direct sunshine should be much more in Chukrata than at places at much lower levels, because there is so much less atmosphere in the way to absorb the heat. The above-quoted experimenters state that on the Faulhorn (about 7,000 feet above the sea) in Switzerland as much as 46 per cent. of the heating power of a vertical sunbeam was absorbed in traversing a cloudless atmosphere.*

* Kaemptz Meteorology by Walker, Ed. 1845, p. 151.

THERMOMETER EXPOSED ON GRASS.

Place and Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Dehra, ... 1871,	39	48	49	58	66	73	72	72	69	55	46	41
Dehra, ... 1870,	38	43	49	56	66	74	74	72	67	58	46	40
Dehra, ... 1869,	...	...	...	...	...	...	...	...	...	...	...	...
Roorkee, ... 1871,	35	45	44	61	71	77	76	76	73	58	44	39
Roorkee, ... 1870,	35	42	49	52	65	74	71	66	61	47	38	34
Roorkee, ... 1869,	37	44	53	59	74	81	76	75	74	59	42	38
Bareilly, ... 1871,	...	...	...	...	...	...	...	...	...	...	..	...
Bareilly, ... 1870,	...	43	54	61	71	80	78	75	74	65	46	40
Bareilly, ... 1869,	...	49	...	...	84	82	77	77	75	58	44	48
Futtehgurh, 1871,	40	50	53	60	69	77	76	76	74	61	51	42
Futtehgurh, 1870,	36	43	52	62	69	76	75	76	74	66	46	40
Futtehgurh, 1869,	36	60	...	62	76	82	76	76	75	60	42	37
Lucknow, ... 1871,	45	51	50	62	70	78	78	78	74	59	50	42
Lucknow, ... 1870,	...	...	...	61	72	79	78	77	75	64	51	44
Lucknow, ... 1869,	...	...	...	...	...	...	...	...	...	...	...	...
Allahabad,... 1871,	40	45	47	61	70	77	77	77	75	60	52	47
Allahabad,... 1870,	4	38	55	61	71	81	...	76	75	65	48	41
Allahabad,... 1869,	...	...	...	...	...	...	...	...	...	...	...	...
Benares, ... 1871,	35	43	46	56	67	73	73	71	70	56	44	42
Benares, ... 1870,	33	44	49	56	63	73	73	71	70	61	44	35
Benares, ... 1869,	32	43	50	52	73	77	73	73	69	58	39	35
Jhansie, ... 1871,	44	52	56	67	73	70	73	70	70	64	58	...
Jhansie, ... 1870,	49	55	62	66	77	80	77	74	72	66	54	47
Jhansie, ... 1869,	48	55	61	72	82	85	78	80	...	...	53	51

OBSERVATIONS BY THE MINIMUM-ON-GRASS THERMOMETER.

This thermometer is a spirit minimum on Rutherford's principle, with a white bulb; it is exposed on the grass all night, and read at 10 hours. The observations obtained by this instrument are the counterpart to some extent of the solar radiation thermometer, as it may be said to tell the highest temperature to which the earth or any object on it may rise when exposed to sunshine, so this instrument tells the lowest temperature to which these may fall by the radiation of their

heat. There is this important difference between the rays of heat from the sun and those from a heated body like the earth. The former are of all refrangibilities, so that many of them have great penetrating power, while the latter are of low refraugibility, and have but little power of penetrating the atmosphere, especially when the aqueous vapour in it is abundant. The above table brings out this, not very strikingly, but sufficiently well. In the months of April and May, when the surface of the earth reaches its highest temperature, yet although all this excess of heat is received during the day, it is quickly radiated out at night through the dry air and cloudless skies, while in June, July, and August, although less heat is received, yet a greater amount is retained by the earth on account of damp air absorbing the radiated heat and thus preventing cooling of the earth by radiation, and restoring part of the heat to the earth and the thermometer on it.

MAXIMUM IN SHADE.

Place and Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November	December.
Chukrata,... 1871,	54	56	63	70	69	72	70	69	70	71	62	59
1870,	57	59	60	71	81	77	70	69	70	71	68	55
1869,	...	...	57	74	84	81	74	86	69	67	62	58
1868,	...	...	...	...	...	...	...	...	...	...	...	...
Dehra, ... 1871,	68	73	81	89	90	88	85	85	86	83	77	70
1870,	68	73	76	85	97	93	85	84	83	83	75	69
1869,	68	70	72	81	99	98	87	86	83	88	73	69
1868,	65	67	76	86	93	92	90	90	89	85	78	70
Roorkee, ... 1871,	71	78	87	97	97	94	89	89	92	91	83	72
1870,	73	75	82	94	107	101	92	91	91	91	83	74
1869,	71	74	80	97	110	107	94	94	90	87	80	76
1868,	69	70	80	96	101	100	96	98	98	94	85	74
Meerut, ... 1871,	70	80	90	99	98	96	90	91	94	96	85	73
1870,	74	81	87	97	108	101	93	93	92	95	87	75
1869,	73	77	83	100	112	108	96	97	92	89	82	75
1868,	...	...	...	...	...	...	...	...	...	...	...	...

MAXIMUM IN SHADE—(*concluded*).

Place and year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Bareilly, ... 1871,	70	76	89	98	99	96	90	90	91	93	85	73
1870,	73	80	87	96	107	102	92	92	90	92	83	75
1869,	73	78	84	101	111	108	97	96	91	86	81	74
1868,	...	...	...	...	...	...	...	...	...	...	...	...
Agra, ... 1871,	70	80	92	100	100	95	87	86	88	92	84	72
1870,	72	82	86	96	108	101	94	89	89	92	84	77
1869,	73	71	84	101	112	110	94	94	88	83	80	73
1868,	69	75	86	99	105	101	98	95	98	96	87	76
Futtehgurh, 1871,	71	79	92	101	100	96	89	87	91	96	87	73
1870,	74	82	88	95	108	102	93	90	89	92	84	75
1869,	73	79	83	103	110	108	95	95	90	87	82	74
1868,	...	...	...	...	...	...	...	...	...	...	...	...
Lucknow,... 1871,	74	81	92	102	101	97	90	93	90	96	88	76
1870,	76	84	91	100	109	103	93	92	90	89	85	78
1869,	77	84	90	106	113	109	95	95	92	88	83	77
1868,	72	78	90	101	102	102	100	98	96	96	88	78
Allahabad, 1871,	73	81	91	100	95	95	88	87	87	91	85	75
1870,	76	84	92	101	111	104	91	88	89	89	81	75
1869,	...	...	...	...	...	...	...	...	...	...	...	...
1868,	...	...	...	...	...	...	...	...	...	...	...	...
Benares, ... 1871,	77	83	92	101	100	97	84	89	90	94	88	74
1870,	78	86	94	103	111	105	96	96	96	95	86	78
1869,	78	86	94	106	114	109	96	99	95	91	86	79
1868,	...	...	...	...	107	100	100	97	98	94	87	79
Goruckpore, 1871,	73	80	89	98	92	94	90	87	86	89	83	77
1870,	74	72	86	96	103	98	89	89	88	88	81	74
1869,	74	82	89	101	104	93	91	88	89	86	81	75
1868,	...	...	...	...	...	...	...	...	...	...	...	...
Jhansie, ... 1871,	75	85	95	105	104	97	86	87	91	99	94	...
1870,	77	83	91	102	111	103	93	92	90	92	88	79
1869,	77	83	90	105	113	112	95	95	90	88	82	81
1868,	...	...	...	...	108	104	97	94	97	99	90	79

MINIMUM IN SHADE.

Place and Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Chukrata,... 1871,	38	40	44	50	52	60	62	60	57	51	45	40
1870,	41	43	43	51	60	62	63	60	57	54	49	37
1869,	...	...	42	55	64	64	61	73	59	52	46	42
1868,	...	...	...	...	...	...	...	...	...	...	...	...
Dehra, ... 1871,	43	51	54	63	69	75	74	73	71	60	50	46
1870,	43	48	53	60	71	76	74	73	69	62	51	44
1869,	44	46	53	61	73	77	74	73	71	59	48	44
1868,	41	44	50	60	67	73	72	72	69	57	50	44
Roorkee, ... 1871,	43	53	53	65	73	78	78	77	74	60	49	44
1870,	41	49	55	63	74	80	78	77	73	64	48	42
1869,	44	49	58	65	77	82	78	78	76	62	47	43
1868,	44	50	55	65	72	80	78	80	75	60	49	44
Meerut, ... 1871,	43	54	55	66	73	78	77	77	75	62	52	45
1870,	...	50	58	64	76	80	79	77	74	64	49	44
1869,	45	47	48	56	71	77	70	70	68	54	40	46
1868,	...	...	...	...	...	...	...	...	...	...	...	...
Bareilly, ... 1871,	44	54	56	66	67	78	77	77	76	64	54	46
1870,	44	54	60	66	75	81	78	77	75	68	50	44
1869,	46	52	60	68	82	84	79	79	76	65	51	46
1868,	...	...	...	...	...	...	...	...	...	...	...	...
Agra, ... 1871,	49	57	62	72	79	80	78	77	75	68	60	50
1870,	46	53	62	70	81	84	81	77	76	71	55	50
1869,	49	54	62	74	88	90	81	80	77	66	54	50
1868,	45	52	60	72	78	82	83	80	80	70	59	50
Futtehgurh, 1871,	45	52	58	68	74	79	77	77	75	65	57	47
1870,	44	50	59	66	76	78	79	77	75	68	51	46
1869,	45	51	61	69	82	86	78	79	77	65	51	47
1868,	...	...	...	...	...	...	...	...	...	...	...	...
Lucknow, ... 1871,	46	53	60	68	78	79	79	79	76	65	57	47
1870,	46	50	61	67	80	83	80	79	77	70	51	45
1869,	45	51	61	73	85	86	81	80	78	67	51	46
1868,	46	55	60	73	75	83	83	82	79	64	52	46
Allahabad, 1871,	46	53	58	67	75	78	79	78	77	68	58	50
1870,	46	51	64	68	77	81	77	76	75	69	54	46
1869,	...	...	...	...	...	...	...	...	...	...	...	...
1868,	...	...	...	...	...	...	...	...	...	...	...	...
Benares, ... 1871,	41	50	54	65	73	77	75	74	73	63	53	41
1870,	41	46	56	63	73	78	74	75	74	66	49	40
1869,	42	49	58	70	81	82	77	77	75	63	47	43
1868,	45	49	...	...	73	79	80	78	76	60	49	42

MINIMUM IN SHADE—(*concluded*).

Place and Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Goruckpore, 1871,	44	52	53	65	68	73	72	71	66	60	49	45
1870,	47	50	60	67	74	77	76	75	74	69	55	44
1869,	49	55	63	73	83	81	76	75	77	69	55	51
1868,	...	...	...	...	...	..	...	...	...	...	...	...
Jhansie, ... 1871,	49	57	63	73	78	75	76	74	73	68	60	...
1870,	47	57	66	71	82	82	79	75	74	69	57	52
1869,	51	56	64	76	37	89	78	79	77	65	54	52
1868,	48	55	69	72	80	83	81	78	78	69	60	52
Ajmere, ... 1871,	44	53	62	71	77	80	75	73	74	67	59	48
1870,	42	51	61	69	80	80	78	74	74	69	54	51
1869,	45	53	58	71	84	83	78	77	73	63	51	48
1868,	42	51	57	69	77	80	79	75	77	67	55	47

MEAN TEMPERATURE OF STANDARD OR OF DRY BULB.

Chukrata,... 1871,	46	47	52	58	60	64	64	64	62	58	51	45
1870,	48	50	51	59	70	69	65	64	63	62	58	44
1869,	...	...	49	64	73	72	67	79	64	59	53	49
1868,	...	...	...	...	...	...	...	...	...	...	...	...
Dehra, ... 1871,	...	...	...	...	...	...	...	...	...	...	..	...
1870,	55	60	64	72	83	84	79	78	75	72	63	56
1869,	56	58	62	74	85	87	81	79	77	69	60	56
1868,	53	55	63	73	80	82	81	81	79	71	64	56
Roorkee, ... 1871,	56	65	71	82	85	85	82	82	83	75	65	58
1870,	57	64	70	80	92	91	85	83	81	77	64	58
1869,	58	62	68	82	95	95	86	85	82	75	63	58
1868,	56	60	68	80	87	89	90	88	86	78	67	58
Meerut, ... 1871,	56	66	73	82	85	86	83	84	83	73	69	59
1870,	...	66	72	81	92	90	86	85	84	79	67	60
1869,	59	62	61	77	91	92	83	83	79	71	61	55
1868,	...	...	...	...	...	...	...	...	...	...	...	...
Bareilly, ... 1871,	56	65	73	82	95	85	82	83	83	78	68	59
1870,	58	67	73	81	91	91	84	84	82	80	66	59
1869,	59	65	71	84	96	96	88	87	83	76	65	60
1868,	...	...	...	...	...	...	...	...	...	...	...	...
Agra, ... 1871,	58	69	78	88	90	80	83	82	83	82	72	62
1870,	60	69	75	84	96	94	88	83	84	83	70	63
1869,	62	67	74	87	99	101	88	89	83	76	69	62
1868,	58	65	75	87	94	92	91	89	89	84	74	64

MEAN TEMPERATURE OF STANDARD OR OF DRY BULB—(*concld.*)

Place and Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Futtehgurh, 1871,	58	66	75	83	86	86	83	82	82	81	72	61
Futtehgurh, 1870,	59	66	73	82	93	88	86	83	82	80	68	61
Futtehgurh, 1869,	59	64	71	86	96	97	86	87	83	76	66	61
Futtehgurh, 1868,	...	...	...	...	...	...	...	...	...	...	...	...
Lucknow, ... 1871,	63	66	78	86	87	...	84	84	82	81	72	62
Lucknow, ... 1870,	62	70	74	85	95	92	85	84	83	81	69	61
Lucknow, ... 1869,	61	70	75	89	99	97	87	87	84	79	68	61
Lucknow, ... 1868,	59	67	76	88	88	92	91	90	87	81	70	66
Benares, ... 1871,	64	71	79	87	88	87	80	83	82	79	72	62
Benares, ... 1870,	65	71	80	86	94	92	86	85	85	82	72	64
Benares, ... 1869,	66	72	80	91	97	95	86	88	85	80	71	65
Benares, ... 1868,	65	70	79	87	89	90	90	88	87	83	69	61
Goruckpore, 1871,	61	67	76	84	83	88	83	82	81	81	71	62
Goruckpore, 1870,	62	68	77	84	90	90	83	83	82	79	71	63
Goruckpore, 1869,	63	71	76	87	95	91	86	86	84	89	71	64
Goruckpore, 1868,	...	..	...	...	...	...	...	...	..	...	...	...
Jhansie, ... 1871,	62	71	81	68	91	87	81	81	81	84	79	...
Jhansie, ... 1870,	65	73	78	89	97	91	82	82	82	81	74	67
Jhansie, ... 1869,	66	71	78	91	98	100	85	86	82	77	72	65
Jhansie, ... 1868,	61	69	76	86	95	90	83	86	87	85	76	69
Ajmere, ... 1871,	61	70	80	88	90	88	82	82	85	83	74	65
Ajmere, ... 1870,	62	70	77	87	94	90	86	81	85	84	74	66
Ajmere, ... 1869,	62	68	75	88	98	95	87	87	82	79	70	65
Ajmere, ... 1868,	60	66	77	85	95	91	88	85	88	84	75	65

OBSERVATIONS ON TEMPERATURE OF THE AIR.

These include the readings of the maximum thermometer in shade, read at 16 hours, the minimum in shade read at 10, and the mean of the standard thermometer read at 4, 10, 16, and 22 hours. There is, however, only standard thermometers in use at Roorkee, Agra, Jhansie, Benares, and Ajmere. At the other stations the mean of dry-bulb thermometer, read at 4, 10, 16, and 22, is what is entered in the register as the mean temperature of the day.

As in hill stations, the temperature of the air is so much lower than those in the plains, any general remarks on air

temperatures cannot be made on both together. Chukrata, therefore, and Dehra also, as being a semi hill station, are not alluded to in what follows:—

The temperature of December exceeds that of January. This is not what might be expected when the relation of the sun to the parts of the earth in which the observing stations are in these months is considered. About the 22nd of December the sun is vertical over the southern tropic, and all places north of the equator have their cold weather. But the coldest time of the cold weather is not when the sun is at its farthest southerly point, but after it reaches a considerable way towards its northern limit. This is like all accumulative effects which usually reach their maximum not when the cause is at its maximum, but some time after,—thus the heat of the air has not reached its highest point at noon, when the solar radiation is most, but is usually observed at 2 hours. An apparent contradiction of this occurs in the temperatures of the hot weather months, which are at their highest not after but before the sun has attained its most northern limit. This is brought about by the south-west monsoon and the clouds and rain it brings, which interfere with the amount of heat received by the air in the month of June when the summer solstice is, and both then and afterwards the temperatures are relatively lower than they are in April and May.

The course of temperature of the air from month to month is well exhibited in the temperature charts which accompany this report. The features of these charts, judging from those in a previous report (1870), have a great resemblance. It may be seen that the maximum temperature of October is usually higher and very seldom lower than in September or August. This is mainly due to the clearing away of the clouds, which allow the earth and the air in contact with it to reach a higher heat than in the previous months; the same cause prevents any interruption in the steady decline in the night minimum after this period.

Although from geographical position such stations as Goruckpore, Benares, and Jhansie are warmer than Bareilly, Meerut, and Roorkee, that difference belongs far more to the cold than the hot weather months. This difference in climate may also be traced to the monsoons, and chiefly to north-east one, which tells much sooner on the Punjab and upper North-Western Provinces than it does on the stations nearer the sea. It may be stated in connection with this that the cold-weather monsoon is usually manifested in tracts close to the Himalayas as a north-west wind, coming therefore from the cold table-lands of Central Asia and across the snowy range.

MEANS OF HUMIDITY.

Place and Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Chukrata, ... 1871,	49	56	54	32	62	87	89	92	83	43	36	50
1870,	44	44	56	45	31	59	93	93	80	58	43	56
1869,	...	...	62	33	30	53	85	92	91	64	40	46
Dehra, ... 1871,	56	55	38	40	52	86	86	86	77	53	46	57
1870,	48	47	51	38	27	53	84	84	78	59	51	50
1869,	49	54	54	33	27	43	74	80	80	63	50	54
1868,	59	67	53	52	40	62	70	69	64	43	38	46
Roorkee, ... 1871,	63	54	29	24	41	68	76	75	65	46	39	54
1870,	47	39	44	33	19	43	72	72	65	51	41	44
1869,	52	61	53	24	31	35	64	67	73	54	46	52
1868,	61	63	43	32	30	50	60	56	51	31	34	49
Meerut, ... 1871,	56	53	32	32	49	66	77	74	85	43	43	52
1870,	39	40	43	31	24	50	74	72	67	46	41	47
1869,	47	43	45	19	23	32	59	60	65	49	41	48
Bareilly, ... 1871,	65	57	37	32	46	68	82	78	85	52	54	59
1870,	54	49	49	42	36	46	77	78	71	57	67	63
1869,	59	42	54	35	31	49	68	69	81	63	51	61

MEANS OF HUMIDITY—(*concluded*).

Place and Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Agra, ... 1871,	54	49	28	25	40	64	78	83	85	39	39	55
1870,	45	42	47	32	20	43	67	74	67	44	37	45
1869,	47	46	46	27	20	29	64	64	79	65	47	51
1868,	56	53	38	29	24	45	55	58	48	28	29	42
Futtehgurh, 1871,	51	50	26	25	41	65	80	84	74	36	41	49
1870,	45	40	40	28	22	47	75	74	78	52	33	39
1869,	44	33	39	18	24	37	70	67	78	58	38	52
Lucknow, ... 1871,	59	55	31	30	48	71	83	87	81	51	43	56
1870,	50	47	40	31	25	51	84	77	81	62	49	50
1869,	54	41	37	22	31	44	76	77	82	64	47	53
1868,	65	53	35	29	39	52	60	62	64	41	55	64
Benares, ... 1871,	47	44	26	27	41	64	82	85	80	47	39	51
1870,	42	36	31	28	22	47	76	72	74	61	53	50
1869,	44	34	27	21	25	45	75	69	50	57	44	52
1868,	64	...	...	...	33	53	59	61	66	33	39	42
Goruckpore, 1871,	59	56	38	44	60	81	84	85	83	63	67	59
1870,	51	52	43	41	41	63	81	80	84	67	54	58
1869,	55	40	43	41	56	60	82	80	82	64	53	62
1868,	...	...	...	...	...	...	...	...	...	...	...	...
Jhansie, ... 1871,	43	40	20	26	33	59	71	84	66	31	28	...
1870,	37	28	33	20	15	47	66	68	66	46	30	37
1869,	37	30	37	17	16	26	65	61	73	52	29	43
1868,	56	42	30	29	22	42	61	57	50	26	27	46
Ajmere, ... 1871,	46	37	27	26	42	58	71	86	54	33	43	43
1870,	37	34	40	28	26	46	63	67	53	40	33	42
1869,	44	44	43	29	30	37	62	59	74	46	35	46
1868,	52	47	39	38	28	46	58	58	44	31	30	40

OBSERVATIONS ON RELATIVE HUMIDITY.

This meteorological element is obtained as a deduction from the readings of the dry and wet-bulb thermometers, which, by means of Apjohn's formula gives the elastic force of vapour at the temperature of the dew point. This, when divided by the elastic force of vapour at the temperature of the air, gives a number which represents the relative humidity. When the dry and wet-bulb read exactly alike, the dew point temperature is also the same, and the atmosphere is in fact

saturated with moisture; the number 100 is taken to represent this. The numbers in the relative humidity columns show how far from, or how near to, this state of saturation the atmosphere was at the time of observation.

Observations with dry and wet-bulb are made at all the stations four times a day at the usual hours for reading the other instruments, but this practice has been carried out only for last year. Therefore, to enable comparison to be made with the three former years, the humidity deduced from the 10 and 16 hour readings have been alone entered in the table. In short, the humidities quoted are those of the days and not of the nights.

In January and December, on account of the low temperature, the relative humidity is high, generally approaching half saturation, although the absolute amount of aqueous vapour in the air is much less than in a warmer month—the warmer the air is the more vapour it can hold without increasing the relative humidity. The amount of vapour is small because comparatively but little evaporation is going on, and the air of the north-east monsoon is very dry. From January on to April and May the humidity diminishes, although it may again be remarked that the aqueous vapour is on the increase. The day hours during April and May, when a hot westerly wind is blowing, are very dry. It is a common occurrence then to observe a difference of forty degrees between the temperature of the dry and wet-bulb thermometers.

At the end of May and beginning of June, before the rains set in, the humidity increases, but little use, however, can be made of this character of the weather as a foreteller of the rains, as it is accompanied or followed very closely by the appearance of clouds in the sky, which, as a sign of rain, are fully more constant and much easier to appreciate than the degree of humidity. It is of course during the rains that the humidity attains its maximum. In October, if the south-east wind has ceased, the humidity rapidly diminishes,

and in November it reaches its second minimum. The condition of the air as to the amount of vapour in it is different from what it was at its first minimum in April and May; for notwithstanding that the whole country is drying up after the rains, yet the temperature is low, and cold air, as before remarked, cannot hold the same amount of moisture as when it is warmer.

The table brings out prominently the remarkable difference between the weather of 1871 and that of the previous three years. The humidity of 1871 is quite a contrast to that of 1868; the contrast is most observable in the month of May, but to lesser extent during the rain months. In 1869 and 1870 the rains were prolonged into October, and that circumstance had increased the humidity for that month, but hardly affected that of November, as might have been expected.

ANNUAL AND MONTHLY TOTAL RAINFALLS.

Place and Year.	January.	February.	March.	April.	May.	June.	July.
Chukrata, ... 1871,	...	...	...	....	·38	15·94	25·20
1870,	·40	1·90	6·27	2·67	·20	10·75	16·30
1869,	...	...	11·92	·60	·05	3·72	8·85
1868,	...	...	...	....	...	...	...
Raneekhet, ... 1871,	1·20	4·2	....	·50	5·7	9·4	12·80
1870,	...	...	...	...	...	...	...
1869,	...	...	...	...	...	...	...
1868,	...	...	...	...	...	...	...
Dehra, ... 1871,	·46	2·55	...	·43	3·48	24·39	36·38
1870,	·03	1·40	4·16	1·85	·31	7·08	33·13
1869,	1·67	...	7·27	·11	...	2·98	20·69
1868,	2·71	7·30	1·80	·85	·82	6·85	21·30
Roorkee, ... 1871,	1·02	3·12	...	·10	1·82	14·42	20·80
1870,	...	1·06	2·30	·93	·19	4·94	14·60
1869,	1·94	1·35	3·24	...	...	2·43	8·04
1868,	1·89	4·42	1·13	·30	1·26	4·24	10·81
Meerut, ... 1871,	1·10	2·17	...	1·0	3·73	6·85	9·79
1870,	...	...	1·93	·85	·75	12·55	9·48
1869,	·85	·66	1·89	...	...	·25	7·60
1868,	...	...	...	...	...	...	...

ANNUAL AND MONTHLY TOTAL RAINFALLS—(*continued.*)

Place and Year.	January.	February.	March.	April.	May.	June.	July.
Bareilly, ... 1871,	2·10	·95	...	1·20	2·10	10·75	20·15
1870,	...	·65	2·10	·50	·85	14·20	10·00
1869,	·85	·20	1·70	·10	...	·60	8·45
1868,	...	...	...	...	...	...	...
Agra, ... 1871,	1·60	·27	...	·42	·2·37	5·76	8·94
1870,	·10	...	3·10	·35	...	4·30	9·38
1869,	·90	·35	·80	...	...	·20	6·00
1868,	·70	·15	·10	...	·40	2·20	12·50
Futtehgurh, ... 1871,	·70	·45	...	·15	1·65	5·02	10·27
1870,	...	·05	·87	·20	1·00	9·10	8·70
1869,	·22	...	...	...	...	·10	14·05
1868,	...	...	...	...	...	...	...
Lucknow, ... 1871,	1·23	...	...	...	1·50	10·77	20·57
1870,	...	...	1·67	·71	...	9·83	15·81
1869,	·17	...	...	...	...	·19	16·86
1868,	·35	·25	·26	·07	2·29	3·40	8·90
Allahabad, ... 1871,	...	...	...	1·10	·74	15·48	24·99
1870,	...	...	·93	·79	...	4·47	16·50
1869,	...	...	...	...	...	...	...
1868,	...	...	...	...	...	...	...
Benares, ... 1871,	...	·20	·55	1·25	·70	8·80	14·40
1870,	...	·17	·46	·30	...	4·00	19·55
1869,	·05	·43	·30	...	...	3·60	12·75
1868,	·72	·15	...	·60	·21	10·10	9·75
Goruckpore, ... 1871,	0·20	·50	·10	·10	5·85	8·53	23·60
1870,	...	·10	·30	·40	1·30	4·70	20·1
1869,	...	...	·20	...	·20	1·05	6,20
1868,	...	...	...	...	...	...	...
Jhansie, ... 1871,	1·80	·40	...	·20	1·30	4·85	6·92
1870,	·30	...	1·00	...	...	6·25	4·90
1869,	...	...	1·30	...	...	...	29·83
1868,	7·50	1·00	·10	·10	...	2·00	9·40
Ajmere, ... 1871,	...	...	...	...	1·12	8·25	6·65
1870,	...	...	...	...	·25	3·40	7·30
1869,	·40	·40	1·95	...	...	...	4·65
1868,	...	·12	·25	·80	·25	1·10	6·38

ANNUAL AND MONTHLY TOTAL RAINFALLS—(*continued*).

Place and Year.	August.	September.	October.	November.	December.	Total.
Chukrata, 1871,	19·24	4·62	...	...	1·21	70·01
1870,	11·77	6·24	·72	...	...	57·22
1869,	16·85	10·30	·77	...	1·95	55·01
1868,	...	...	...	...	...	...
Raneckhet, 1871	9·70	4·20	...	...	2·45	...
1870	...	...	...	...	...	...
1869	...	...	...	...	...	...
1868	...	...	...	...	...	...
Dehra, 1871,	38·46	11·09	...	...	1·32	118·56
1870,	28·50	13·81	1·39	...	·01	91·67
1869,	16·85	22·62	2·41	...	1·22	75·82
1868,	12 88	3·04	·05	...	·18	57·78
Roorkee, 1871,	14·20	1·98	...	...	·82	58·28
1870,	12·96	6·34	·72	...	...	44·04
1869,	6·91	9·04	1·16	...	1·00	35·71
1868.	1·43	1·09	...	...	0·11	26·68
Meerut, 1871,	5·85	·50	...	...	1·8	31·79
1870,	8·16	3·95	...	...	...	37·67
1869,	3·39	3·83	·50	...	·25	19·22
1868,	...	...	...	...	...	...
Bareilly, 1871,	6·50	2·20	...	...	1·85	47·80
1870,	8 55	12·95	1·15	...	·35	51·30
1869,	5·58	19·91	3·50	..	1·40	42·29
1868,	...	...	...	...	...	...
Agra, 1871,	9·28	4·06	...	...	·98	33·68
1870,	7·05	·56	...	...	·27	25·11
1869,	2·50	12·10	3·70	...	·80	27·35
1868,	1·30	·17	...	...	...	17·52
Futtehgurh, 1871,	5·47	1·05	...	...	1·00	25·76
1870,	11·75	6·90	...	...	...	38·57
1869,	4·02	9·72	3·85	...	1·50	33·46
1868,	...	...	...	...	...	...
Lucknow, 1871,	5·11	20·16	...	...	2·11	61·45
1870,	18·36	17·16	2·44	...	...	65·98
1869,	5·52	13·16	4·11	...	1·43	41·44
1868,	3·70	8·12	...	...	...	27·34

ANNUAL AND MONTHLY TOTAL RAINFALLS—(*concluded*).

Place and Year.	August.	September.	October.	November.	December.	Total.
Allahabad, 1871,	7·36	11·81	...	...	1·51	62·99
Allahabad, 1870,	16·84	7·99	10·28	...	...	57·80
Allahabad, 1869,	...	...	...	...	...	...
Allahabad, 1868,	...	...	...	..	...	...
Benares, 1871,	14·75	13·51	...	...	1·25	55·41
Benares, 1870,	9·10	7·25	5·37	...	...	46·20
Benares, 1969,	6·92	9·92	4·90	...	...	38·87
Benares, 1868,	4·05	5·85	...	...	...	31·43
Goruckpore, 1871,	21·00	19·00	...	...	·9	79·78
Goruckpore, 1870,	17·20	8·30	3·10	...	...	53·50
Goruckpore, 1869,	12·50	9·70	10·50	...	·20	40·55
Goruckpore, 1868,	...	...	...	...	...	...
Jhansie, 1871,	11·40	6·90	...	...	...	33·77
Jhansie, 1870,	8·95	6·20	1·70	...	...	29·30
Jhansie, 1869,	3·34	9·90	5·70	...	·40	50·47
Jhansie, 1868,	·90	2·20	...	...	·40	23·60
Ajmere, 1871,	·55	4·25	...	·90	...	21·72
Ajmere, 1870,	11·30	·20	·40	...	·40	23 25
Ajmere, 1869,	1·55	14·60	·20	...	·13	23·88
Ajmere, 1868,	·85	...	...	...	·60	10·35

OBSERVATIONS ON RAINFALL.

The above table contains too few elements for a complete discussion of rainfall, which is one of the most irregular of meteorological phenomena. The table could have been extended so as to have included more years for some of the stations; but these would not have helped much in bringing out more clearly the distribution of the rainfall within the area of the North-Western Provinces.

The table shows that the major precipitation of rain takes place along the tract nearest to the Himalayas as shown by the rainfalls of Roorkee, Bareilly, Lucknow, and Goruckpore. Dehra is a further illustration of this, being immediately under the Mussoorie hills; it has as high a rainfall as Mussoorie

itself. That the stations nearer the Himalayas get a large share of rain is a circumstance which has been long known, and the reason of it well understood, so that I need hardly repeat that this lofty mountain chain arrests the south-west monsoon, and, by giving it an upward direction, cools it, and compels it to discharge its moisture.

The two stations in the table which are at the greatest distance from the Himalayas are Jhansie and Ajmere, and although the numbers representing their rainfalls offer no contradiction to the above explanation, yet there are circumstances about both stations which give an additional cause to their lesser rainfall. Jhansie and Ajmere both lie to the north and east of very high land, which has already robbed the south-west current of much of its moisture; indeed, neither of these stations lie within the direct range of the rain-bearing wind of the North-Western Provinces, which, although it sprung from its source in the Indian Ocean as a south-west wind, has been deflected by the mountain chains, especially that to the north of Lower Bengal, and converted into a south-east wind, blowing chiefly up the Gangetic Valley. It is this fact which accounts for the higher rainfall of Benares and Allahabad, compared with Agra, Futtehgurh, and Meerut. The same circumstance explains the earlier occurrence of the rains in Bengal, and the stations nearer it than in those further to the west and north. The rainfall of Jhansie in 1869 was very high from a very large fall having occurred on the 23rd and 24th of July: 15⅓rd inches fell in 36 hours, and very nearly 30 inches fell in the whole month. Some enquiry was made into this rainfall at the time, but it does not appear that any mistake was made.

In all the stations, except Meerut, Bareilly, Futtehgurh, and Lucknow, the rainfall of 1871 was the highest of the four years under comparison, and even in these, except Futtehgurh, the fall, although not the highest, was yet higher than the average. The duration of the rains was likewise longer

in 1871 than in the previous years—beginning early in June and not ceasing till the end of September.

Some unusually heavy rains took place within the drainage area of the Goomtee river in Central and Eastern Oudh and the District of Jounpore in August and September last, by which a great part of Jounpore city, which stands on the Goomtee, was destroyed.

2.—*Reply of Government, North-Western Provinces, to* REPORTER ON METEOROLOGY, *North-Western Provinces (No.* 1518A).—*Dated Nynee Tal, the 10th September,* 1872.

I HAVE received and laid before His Honor the Lieutenant-Governor the annual report on Meteorological Observations taken in the North-Western Provinces during 1871, submitted with your letter No. 93, dated 1st April, 1872.

2. The report is valuable and interesting, and I am to convey the Lieutenant-Governor's thanks to you for the careful manner in which it has been prepared. The monthly reports have, as suggested in the orders of last year, been printed as Appendices, in which shape the barometric and temperature and rainfall charts for the different stations also appear; while the body of the report itself now contains, as it should, only a general account of the leading features of the weather, together with such conclusions and remarks as are suggested by the observations taken.

3. The preliminary summary which you have given of the weather of 1871 is brief and clear, and meets the wishes of Government as already expressed. The most remarkable feature in the year was the absence of the great heat and dryness which usually characterise the months immediately preceding the rains. In the latter end of April and in May there were frequent storms of rain, so much so, that at all the plains stations, except three, the average temperature of May was cooler than that of April, and at these three, Roorkee, Bareilly, and Agra,

the temperature of the two months was the same. The Lieutenant-Governor, in his progress to Nynee Tal, was struck with the green and grassy look of the country, which presented a marked contrast to the brown and withered aspect it usually has at that season. This abnormal hot season was followed by an unusually early setting in of the rains, and a rainfall much above the average.

4. You observe that the *cause* of this phenomenon was the relative depression of the barometer over the North-West Provinces as compared with Bengal, and this, you add, determined the early setting in of the moist south-east and easterly winds. But it appears to His Honor that in the present state of our meteorological knowledge this must be looked on rather as a speculation than as a positive conclusion established by known facts. The depression of the barometer and the early rains were simultaneous phenomena, and it is difficult to say which was cause and which was effect, or whether both were not effects of some other cause possibly itself extraneous to the continent of India.

5. This truth is apparent from what you yourself say as to the tables of barometric means having failed to realise the end which was proposed in their construction, that is, to show any direct connection between the local barometric pressure and the local fall of rain. You remark that the rainfall in India is due to causes which are in operation over a large part of the earth's surface, and that it is hardly possible to obtain a sufficiently large induction from the facts observed in so limited an area as the observing stations of the North-Western Provinces. It would seem to follow that, from these statistics taken by themselves, we cannot hope to attain any final result, or to gain any positive knowledge of the general laws of meteorology; we can only hope that they may be a means to that result when collated with other and more widely gathered facts by a central hand. In order to contribute to this end, His Honor would wish you to utilise the data at your disposal from other quarters. The observations made throughout India and

the adojining seas are the class of statistics which would be of primary use towards this object. You should next turn to any information that may be available from the countries surrounding India, especially those which may be supposed more immediately connected with the source of the monsoon. The meteorological observations of other countries, as Africa with its periodical rains, and Australia with its season of heated winds, might also furnish useful analogies.

6. Your explanation of the reason why the fall of the air pressure from its maximum in January to its hot weather minimum in June or July is slower than its rise from the minimum up again to the cold weather maximum, namely, that the difference is caused by the rapid increase in the air pressure which takes place on the cessation of the south-west and the setting in of the north-east monsoon, when the stream of cold air pours down from the Himalayas in the end of October and the beginning of November, seems natural and sound.

7. With reference to your remarks as to the imperfection of the solar radiation thermometers now supplied, it appears advisable that special solar radiation thermometers should be made, tested, and compared at Kew, and the index-error given for the highest temperature to which they can be exposed in India. The errors arising from the irregular expansion of the thermometer tubes necessitate this, and the Government of India will be addressed with a view to having the defects remedied which have been pointed out by you.

8. The results brought out by the observations taken with this instrument at Chukrata are noticeable, and hardly what would have been expected. On the parallel of the experiments, quoted by you, made on the Faulhorn, it might have been expected that the black bulb in the sun at Chukrata would always have stood higher than the plains stations. It may be, however, that there is some imperfection in the solar radiation thermometer which makes the bulb under certain circumstances lower than it ought to be. I am to suggest

that it would be well to have these solar radiation thermometers at other hill stations than Chukrata.

9. The table you give of observations with the thermometer exposed on grass is valuable, but it seems open to doubt if the instruments are always uniform. Benares looks suspiciously low, Futtehgurh and Jhansie suspiciously high, in the winter months.

10. The statement of the means of humidity also suggests the idea that the apparatus may not in all cases be perfectly reliable. Ajmere is not nearly so dry as one would have expected. At the same time the extraordinary dryness of the rainy months at Jhansie in 1868-69 (seasons of drought) is remarkably brought out by some of the entries.

11. With regard to the rainfall observations, I am to suggest that in future you should, as far as possible, collate the rain returns supplied in the Revenue Department. They are at least approximately accurate, and it would be of interest to see how the mean results are affected by and follow the distribution of the rain over the minute sub-divisions of the country of which the fall is reported to the Board of Revenue. Moreover, this is the more to be desired since observations of rainfall at single spots so widely scattered as those at which the meteorological observations reported on by you are taken may be misleading. Nothing is so capricious as the rainfall of this country. There is often 50, sometimes 100, per cent. difference between stations within a few miles of each other. Consequently the more numerous and closely spread over the country the observing posts are, the more accurate an average will be obtained.

12. The statement appended to your report shows that the total expense of maintaining meteorological observations at the twelve first class stations during the financial year 1871-72 amounted to Rs. 10,800. It seems, however, that only ten Native observers are charged for. You explain that the Observatory at Dehra costs this Government nothing, both the

establishment and instruments belonging to the Trigonometrical Survey; but excluding this, there remain eleven stations in the North-West, and it is not known at which of these a Native observer is not maintained.

13. With reference to the barrack temperature registers called for by the Sanitary Commissioner to the Government of India, I am to add that should there be anything of interest in them, copies should be kept, and any noticeable facts or conclusions given in your future reports.

14. In conclusion, I am to thank Mr. J. Elliott, who, during nearly the whole year, officiated in your absence, for his efficient discharge of the duties of the post. His cold weather tour, during which he compared the standard barometer at Roorkee with those in use at other stations, and fixed the error of each in relation to the Kew standard, was very useful. Such tours should be repeated: they cannot but have a good effect in testing the efficiency both of observers and of instruments. Too much attention cannot be paid to this point, lest the whole fabric of report and hypothesis should be founded more or less upon a basis of error.

Art. XX.

REPORT ON THE GOVERNMENT GARDENS, N.-W. PROVINCES, FOR 1871-72.

1.—*From* SUPERINTENDENT, BOTANICAL GARDENS, *to* SECRETARY TO GOVERNMENT, *North-Western Provinces* (*No.* 1179).—*Dated Botanical Gardens, Saharunpore, the* 11*th May*, 1872.

I HAVE the honour to submit, for the information of the Hon'ble the Lieutenant-Governor, detailed statements showing the works that have been carried on in the Gardens, North-Western Provinces, during the last year, or from April 1st, 1871, to March 31st, 1872.

2. During this period there were issued to the different Departments, including Canal, Civil, Customs, Jail, Military, Police, Public Works, Railway, Stud Departments, and to public gardens and the public generally :—

Fruit trees.	Flowering shrubs and timber trees.	Parcels of seeds.
35,967	1,47,963	3,550.

Showing a considerable increase on the issue of 1870-71. Thus :—

Year.	Fruit trees.	Flowering shrubs.	Parcels of seeds.	
1870-71, ...	35,649	74,766	2,939	
1871-72, ...	35,967	1,47,963	3,550	

3. It would be superfluous in me to enter into details regarding the distribution of plants and seeds, as I have done so in Appendix No. 1.* But I may briefly notice a few items.

* Not printed.

To the Canal Department the large supply of two thousand and forty-four parcels of seeds, weighing 8,176 lbs., or upwards of three and a half tons, have been distributed. To the Military Department six hundred and forty-three parcels of seeds have been issued. To the Public Gardens of Lahore, Loodianah, Umballah, Raneekhet, Paoree, Lucknow, Allahabad, Roorkee, Banda, Ghazeepore, Jeypore, &c., large numbers of flowering shrubs and timber trees have been issued. To the India Office, for distribution to public institutions and private parties, 99 parcels of seeds have been forwarded per pattern post. To the Medical Department, including the Chief Medical Store-keeper, Calcutta, and Medical Store-keepers, Allahabad and Sealkote, large supplies of drugs as per margin.

	lbs.
Extract of Hyoscyamus, ...	384-11
Dried leaves of ditto, ...	265
Atees Tubers (Aconitum heterophyllum), ...	1,280
Oak Bark, ...	80
Kamaillah powder (Rottleria tinctoria,) ...	38

4. Other Departments I might notice, which, however, is unnecessary, as detailed statements have been given in Appendix I.*

5. *Experiments made during the season.*—The most important is that of the Rhea plant (Bœhmeria nevia), which has been cultivated on a considerable scale. During the season 1,039 maunds of green stems were cut down and dried, and large quantities sent to private parties and to the India Office, London, for distribution to applicants in England. In store there are still upwards of one hundred maunds available for distribution. There are, too, thirty-five acres of Rhea plants under cultivation at Saharunpore, and in excellent order, and ready to cut as soon as the mechanists who have brought machines to compete for the prize of £5,000 offered by His Excellency the Governor-General in Council are ready to commence operations. There are now four machines in the building set aside for housing the machines, and a portable steam engine with shaft and gear to work six machines at one and the same time. Of the four machines now

* Not printed.

present, one, belonging to Mr. Mather, of Edinburgh, is about to be withdrawn by his manager, Mr. Bryce, as it does not come up to his expectations. Two others are Roezl's fibre cleaning machines, forwarded to India by Her Majesty's Secretary of State for India, to be tested as to its capabilities for cleaning Rhea, and the fourth is a machine patented by Mr. J. Greig. This fine machine is not yet quite ready to enter the list, but will be so in a few days.

6. It is a general idea that the Rhea plant will grow anywhere. This is to a certain extent true as far as the mere growth is concerned. But to obtain a good crop the soil must be light, rich, well-drained, highly manured, and irrigated. If water, however, is allowed to lie for any length of time at its roots it will die. Thus, during the last rains, several acres of Rhea plants were destroyed by the incessant downpour.

7. If a good, cheap, and easily worked machine be the result of the prize offered by Government, Rhea fibre will soon become a staple article of exportation, and of far greater value to the North-West Provinces than Jute is to Bengal. By the plants in the plantation several hundreds of acres might easily be planted, as they now form a dense mass, varying in height from 7 to 8 feet. Irrigation is absolutely necessary to obtain large crops, and if not available in the hot weather, the Rhea plant is liable to die off or to be destroyed, like sugar-cane, by white-ants. It is readily raised from cuttings, and in the hot beds lately built several lacs were propagated in a few months. This shews with what rapidity a large tract of land might be brought under cultivation with the plant.

8. *Silk cultivation.*—Large plantations of mulberries have been formed at Saharunpore and at Chandwallah in the Deyrah Dhoon, and any number, up to a lac, are now available for distribution. At the disposal of Colonels Willows and McPherson fifteen thousand plants have been placed for

distribution to the men of the 2nd Goorkha Battalion, in order to introduce the cultivation of silk into the Dhoon, a place well adapted for the purpose. That the cultivation would pay in the hands of Europeans I very much doubt. But to Native villagers it would, on the contrary, be invaluable, as when not engaged with their crops they would find employment in rearing silk-worms, or in reeling silk from the cocoons; nor ought it to be attended with much expense. The plan proposed by Colonel Willows to supply mulberry plants and silk 'seed' to the families of the 2nd Gorkha Regiment has in it all the elements of success, and if encouraged, silk may ere long become another staple of exportation from the Dhoon. The Superintendent of the Dhoon might, with great advantage, be authorized to offer three or more prizes; 1*st*, for the best sample of prepared silk, 2 lbs in weight; 2*nd*, for the best specimens of cocoons, five seers in weight; and 3*rd*, for the best plantation of mulberries of kinds, consisting of not less than five acres.

9. In China the rearing of silk is carried on by men, women, and children (see "Mrs. Godfrey Clerk's Travels Round the World"), and once a few parties take up the work resolutely in Deyrah Dhoon, it will soon spread throughout the Dhoons and Lower Himalayas.

10. *Cinchona Cultivation.*—It has not, I regret to state, made much progress. At Hawul Baugh and Ayar Tolah there are the following plants, (*vide* margin.)

At Hawul Baugh—	
Cinchona Succerubra, ...	138
C. officenalis,	82
Total, ...	220
At Ayar Tolah—	
Cinchona Succerubra, ...	252
C. officenalis,	48
Total, ...	300
Grand Total, ...	520

In the Government Garden at Raneekhet there are also a number of plants, but during the last winter they suffered much from the severity of the cold, and some of the largest plants were cut down. Other but lower localities have been selected, and fifty plants have been set aside for the Commissioner of Kumaon to try in the

Bhabur. A hundred plants have been reserved for the Forest Officers for a similar purpose. From Mr. Gammie, in charge of Plantations, Darjeeling, large supplies of Cinchona seeds have been received, which have germinated freely, both at Ayar Tolah and Hawul Baugh.

11. For superintending the work one of the most intelligent and active Natives, brought up in the Government Gardens, has been appointed, and to assist him two expert propagators have been imported from the Darjeeling Cinchona Plantations.

12. *Chestnut cultivation.*—In the Chundwallah Nursery 150, and at Mussoorie, Chejouri, and Hawul Baugh 130, plants have been planted out, numbers of which yielded seed last season, which have also been distributed to different parties. To Colonel Ramsay a number of plants have been forwarded for distribution in Kumaon. The plant is now thriving in a number of localities, and the seed is now a regular article of commerce, being common in the bazaars of Deyrah and Landour, and sold at from one to two rupees per pound, the supplies being chiefly obtained from the late Government Garden at Kowlaghir in the Dhoon, formed many years ago.

13. The first plants raised were from seeds imported from China. Latterly large numbers of seeds have been obtained from England through Dr. Forbes Watson, India Office, London. But to establish thoroughly such a valuable tree, annually two or three bushels ought to be sent from Europe for several consecutive years by the Suez Canal route.

14. The different coniferous trees of the Himalayas are now fairly established in Europe, and that has been brought about by the annual transmission from the Saharunpore Gardens of large quantities of seeds. In some seasons upwards of a ton have been forwarded, and in England and Scotland in many districts the Deodar, Kuel, and Silver Pine, are as

common as the Larch and Scotch Fir. Nor does the demand abate. Throughout the length and breadth of the United Kingdom and Ireland there is not a park or pleasure-ground in which some of the Himalayan coniferæ are not to be met with. Several of the Royal Forests, too, have large tracts planted with Deodar raised from tons of seeds sent from the Saharunpore Gardens. Were timber seeds sent from England in equal quantity, many of the valuable timber trees there met with might now be equally common in the Himalayas. I allude to the Chestnut, Larch, Beech, Birch, Ash, Lime, Oak, &c.,

15. Formerly the expense and difficulty of transit was a great drawback, and the success attending the transmission most mortifying; now a box of any dimensions has only to be shipped in London or Liverpool, and forwarded to Bombay, *vid* the Suez Canal, and in less than thirty-five or forty days from the date of shipping it is able to reach its destination at the foot of the Himalayas. But one thing is wanting: an authorized agent at Bombay to receive and forward cases on arrival.

16. *Donations to the Gardens.—Fruit trees.*—Seven cases filled with fruit trees, forwarded by orders of H. M.'s Secretary of State for India by Dr. Forbes Watson from the India Office, have been a great success. The collection, consisting of Apricots, Plums, Peaches, Nectarines, Cherries, Apples, Pears, Gooseberries, Vines, Raspberries, Figs, arrived at Saharunpore on the 19th March in excellent order. The collection consisted of 331 plants, and the entire loss was not more than four per cent. The plants were carefully packed in wooden cases with dry moss.

17. *Roses and Fuchsias.*—Almost equal success attended the exportation from the India Office by Dr. Forbes Watson of one hundred Roses and thirty Fuchsias, 98 of the former and 14 of the latter having arrived in excellent order. All these plants, both fruit trees and flowering shrubs, are being

propagated in large numbers. The vines in particular are well worthy of notice, as in the collection now at Saharunpore all the best kinds now met with in England are to be found, as Buckland's Sweet Water, Royal Ascot, Muscat Hambro, Mrs. Princess Muscat, Lady Downes, Morris' Early Hambro, General De La Marmora, Cransford's Muscat, Black Damascus, Black Monucka, Troveror's Muscat, Black Prince, West St. Peters, White Frontignan, Black Burgundy, Muscat of Alexandria, Sweet Water, Australia, Syrion.

18. For these vines a pucka vinery has been made, the old wooded vinery having been entirely destroyed by white-ants.

19. That the Himalayas possess immense advantages for rearing all the best kinds of fruit trees met with in Europe cannot for a moment be denied by any one who has traversed them, and the great drawback has ever been the transit carriage. But this difficulty is being removed; a magnificent road is being carried from Ramnuggur in the plains to Raneekhet, and thence on to Almorah, to be ultimately carried on to the Kousaneh Range, which bounds the Byjnath Valley to the south, and when the rail is finished from Ramnuggur and thence through Rohilkhund to join the great Indian Railway, fruit, the produce of the Gardens of Raneekhét, Hawul Baugh, &c., and potatoes, &c., may become a regular article of export to the plains.

20. *Potatoes*—The following are the kinds received from Her Majesty's Secretary of State through Dr. Forbes Watson, *viz.*, Early Oxford, Milky White, Rivers Royal, Ashford's Flukes, Sutton's Flukes, and have been propagated and distributed to different parties—*viz.*, Colonel Ramsay, Commissioner of Kumaon, Dr. Grant, Superintendent of Jail, Futtehgurh, and the Officer Commanding 2nd Battalion, 12th Regiment, Subathoo. The quantity of potatoes now grown in Kumaon, Gurhwal, Deyrah Doon, Roorkee, Saharunpore, Simla, District Dhurmsalah, Meerut, Futtehgurh, is enormous. By all classes of Natives the potato is extensively used as an article of food.

In the open air bazaar on the roadside leading from Saharunpore to Hurdwar, which is annually formed during the melah season, I observed that potatoes formed one of the chief articles of food of the poorer pilgrims. But in several places the potato has degenerated, as in Kumaon, Futtehgurh, &c., it having become watery and waxy, caused by the continued cultivation of the same kinds in the same localities. To remedy the evil, seed from other localities ought to be imported, and for this purpose we have sent quantities to the parties mentioned. To the late Mr. McKinnon and Native cultivators at Mussoorie a quantity of potato seeds has also been distributed.

21. *Pedigree Wheat.*—Two bushels of this kind of wheat have been received from the India Office, but the greater part arrived too late for sowing. I have therefore reserved it for sowing in the ensuing autumn.

22. *Seeds,—vegetable and flower.*—A large supply of vegetable and flower seeds have been received from the India Office through Dr. Forbes Watson, the greater part of which arrived in good order and have germinated freely, by means of which and the Cape and American seeds purchased the stock of the gardens has been renewed.

Bulbs.—A fine collection of bulbs has also been received from the India Office. They were packed in 28 packages, and forwarded by pattern post, and their transit averaged 35 days. Half were packed in wooden boxes and half in tin cases with charcoal. Both were covered with coarse canvas. The bulbs wrapped in brown paper and packed with charcoal in hermetically sealed tin cases were quite moist, and the bulbs similarly packed in wooden cases were quite dry, showing that as a rule bulbs ought not to be packed in hermetically sealed tin cases.

To Dr. G. King the Gardens are indebted for some valuable seeds and fruit trees: amongst others I may mention fifty Custard Apple trees.

23. From the Reverend J. Fordyce, Simla, three plants of the *Amherstia nobilis*, brought from Rangoon, have been received. From the Lahore gardens a small collection of roses and fruit trees have been obtained through Dr. Brown, in exchange for large numbers of fruit trees and flowering shrubs.

24. *New buildings in the Gardens.*—In the Mussoorie garden the green-house, which has been in the hands of the Public Works Department for upwards of two years, is now nearly finished. This building has been a great desideratum.

25. In the Saharunpore garden a pucka vinery, 100 feet in length, has been erected to replace the old wooden vinery, which had been entirely destroyed by white-ants. In this vinery the fine vines received this and last year from Her Majesty's Secretary of State have been planted.

26. *Museum and Library.*—Several interesting donations have been made to the Museum, which are worthy of notice.

27. By Her Majesty's Secretary of State two Roezl's fibre-cleaning machines have been presented, which are now on their trial with green Rhea stems, the result of which will form another communication.

28. A collection of eight specimens of Rhea fibre and forty-eight specimens of fabrics prepared from the Rhea fibre. Some of the fabrics are very fine, and show the kind of cloth capable of being manufactured from the Rhea fibre. For this interesting collection the Museum is indebted to the Secretary to Government of India, Department Agriculture, Revenue, and Commerce.

28*a*. Some fine specimens of Rhea fibre, prepared by Mr. Montgomery, Kangra Valley, and Dr. Collier of London, also presented by the Secretary to Government of India, Department of Agriculture, Revenue, and Commerce.

29. A magnificent collection of implements and machines were presented last season by Her Majesty's Secretary of

State for India, and in compliance with the orders of His Honor the Lieutenant-Governor, contained in your letter No. 882A., dated 27th June, 1870, to the address of Mr. Commissioner Court, and his successor, Mr. Commissioner Lind, invited all parties, both European and Natives, in his Division interested in agricultural pursuits, to attend at Saharunpore on the 20th April last to witness their working on the Stud Farm. The machines consisted of reaping, thrashing, winnowing, grinding, or crushing ploughs, horse-rakes, harrows, &c.

30. All the districts of the Division were represented, but the Collectors of Meerut, Boolundshuhur, and Dehra Doon were unable to be present, owing to pressing duties requiring their presence elsewhere. I append a list* of some of the Natives present from different districts.

31. The European community were represented by Messrs. Lind, Jenkinson, Probyn, Keene, Colonel Irwin, Dr. Garden, Messrs, Nelson, Bryce, Greig, White, &c. To shew the simplicity of the machines they were placed in position before the assembled Natives, consisting of from three to four hundred. The reaping machine was first taken in hand, and the excellent way in which it did its work was the admiration of all. Crowds followed it, it being drawn by a pair of bullocks. Mr. Lind, Mr. Jenkinson and Colonel Irwin also followed it, and explained to numerous inquirers its action. The drivers were Mr. Nelson and the ploughmen of the Stud lands and Government Gardens. Natives thus saw that the machine was easily worked. After reaping a tract of land, the grain was conveyed to the thrashing machine and thrashed with great rapidity. From the thrashing machine it was conveyed to the winnowing machine and cleaned. Here numbers of Natives crowded round the machine, lifting handfuls of grain to examine the manner in which it was cleaned, and expressing the highest satisfaction at the efficient manner in which the work was done. A quantity of grain having been cleaned, it was then conveyed to the grinding machine. This process caused,

*Not printed.

throughout the assembled crowd the highest gratification, evinced by numerous exclamations. As it issued from the machine, the grain, barley and gram, was frequently examined, and highly approved of. The machine was worked in the heartiest manner by Mr. Jenkinson and Colonel Irwin, aided by Mr. Nelson and the mechanical Engineers, Messrs. Bryce Greig, and White, which caused quite an enthusiasm amongst the Native community, and thus made the exhibition quite a success, and until the shades of night had set in, numbers of Natives did not leave the ground. Altogether the working of all the machines exhibited appears to have given the highest satisfaction. Owing to darkness having set in, the experiments with Howard's and other ploughs, harrows, horse-rakes, &c., were postponed. This was not so much to be regretted as, owing to it being harvest time, the working zemindars could not attend. For such experiments October November will be more favourable. Were social gatherings of such a nature encouraged and presided over by such officers as Messrs. Lind, Jenkinson, and Colonel Irwin, and machines and implements of the West periodically exhibited in divisional districts on rotation, I doubt not but that they would soon come into general use in the East, particularly in the large zemindaries of the North-West Provinces. Many inquiries were made regarding the price of the machines.

Since the exhibition the thrashing machine has been in constant work in the Stud Farm. The result will afterwards be given.

I have attended many agricultural exhibitions in Europe, but nowhere have I seen visitors take such a lively interest in the working of the machines exhibited.

32. *Visitors to Museum.*—In the Museum visitors' books 4,800 (four thousand eight hundred) visitors' names have been entered in English, Persian, Hindee, and Shastree, but this gives a very faint idea of the numbers of visitors, as thousands, unable to sign their names, visited the building.

33. *Library.*—Some interesting books have been added (see Appendix Nos. 4A. and B.)*

34. Before finishing this report, I beg to bring to notice Mr. J. Nelson, the active and energetic Head Gardener, who has rendered great assistance in working the gardens. Nanuk Chund and Shunker Lall, Chowdhries, have carried on the duties entrusted to their charge most vigorously. The Head Herbarium, Coora Singh, has efficiently discharged his work, and to Heera Lall, the Head of the Seed Issue Department, I am under great obligations for the laborious manner in which he has performed his duty, and his Assistant, Nuthoo Singh, also deserves commendation for his activity and assiduity. From Baboo Nahur Singh I have received most efficient aid, and his Assistant, Ramjee Doss, has also done good service.

2.—*From* SECRETARY TO GOVERNMENT, *North-Western Provinces, to* SUPERINTENDENT OF BOTANICAL GARDENS (*No.* 945*A.*) —*Dated Nynee Tal, the* 27*th June,* 1872.

I am directed to acknowledge the receipt of your letter No. 1179, dated 11th May, 1872, with enclosures, being the report on Government Gardens in the North-West Provinces, for the year ending March 31st, 1872.

2. The increased distribution of fruit trees, flowering shrubs, timber trees, and parcels of seeds during the year, as shown in the margin,† is satisfactory. His Honor notices with special approval the benefit conferred by the gardens on the country by the supply of country medicines‡ to the Medi-

Distribution of fruit trees, &c.

	1870-71.	1871-72.
†Fruit trees, ...	35,649	35,967
Flowering shrubs and timber trees,	74,766	1,47,963
Parcels of seeds, ...	2,939	3,550

	1869-70.	1870-71.	1871-72.
‡Extract of Hyoscyamus,	lbs. 101-3	lbs. 242-4	lbs. 384-11
Dried leaves of do.,	„ 199-8	„ 423-0	„ 265-0
Atees Tubers (*aconitum-heterophyllum*),	„ 957-0	„ 940-0	„ 1280-0
Oak bark, ...	*Nil.*	*Nil.*	„ 80-0
Kamaillah powder (*Rottleria-tinctoria*),	„ 70-0	„ 41-8	„ 38-0

* Not printed.

cal Department. The figures in the margin clearly prove the increasing benefits derived from the gardens in a medical point of view.

3. *Para.* 5.—The most important of the experiments during the season has been the cultivation of the Rhea plant.

Experiments during the season.

During the year 1,039 maunds of green stems have been cut, dried, and distributed; there are still upwards of 100 maunds in store available for distribution. The future success of the plant depends on the results of the working of the machines which are at present under trial, and His Honor entertains no doubt that your anticipations as to the Rhea fibre becoming one of the staple productions of the North-Western Provinces are not too sanguine, provided that machinery suitable for working it can be invented.

4. *Para.* 8.—With regard to your suggestion that prizes should be offered by the Superintendent of the Dhoon for the best cultivation of mulberries, I am to state that the question of the mulberry cultivation must stand or fall with that of rearing silk-worms and establishing filatures. This forms the subject of separate correspondence, and is at present under the consideration of the Government of India, and need not be further considered here.

5. *Para.* 10.—It is observed that there are at present 520 Cinchona plants under cultivation. His Honor understands (though no particulars are mentioned by you) that few of the plants are above an inch in height, and that all still need the protection of glass. The experiment during the year has not been promising. It appears to His Honor very doubtful whether the Himalayas in these Provinces will admit of the successful cultivation of Cinchona. It is now being tried in various localities in Eastern Kumaon and by a few landholders under the superintendence of Colonel Ramsay, but hitherto without any token of success. The experiment must, however, be patiently continued until it is proved either that there

is no hope of a spot suitable in soil and climate for its cultivation being found, or until its success is fully established.

6. *Para.* 12.—The increasing popularity of the Spanish Chesnut, which is said to be a regular article of commerce in the Dehra and Landour Bazaars, is observed with satisfaction. The cultivation of this species is highly important, and deserves careful attention. If prosecuted diligently, this tree is likely to become a naturalized inhabitant of these provinces, and both popular and useful for the sake of its fruit. The suggestion contained in para. 13 of your letter, that for several consecutive years a regular supply of two or three bushels of seeds should be sent from Europe, will be recommended to the Government of India.

7. *Para.* 15.—With reference to your suggestion that an authorized agent should be appointed at Bombay to receive and forward cases on arrival, I am to state that Messrs. King, King and Co. have been appointed agents for this purpose.

8. It is observed that no mention is made in the present report of the cultivation of Carolina Paddy, or of experiments connected with cotton, and that no particulars have been given of the effect of the chemical manure on which experiments were made. I am to refer you to paras. 5 and 11 of the Government orders (No. 991A., dated 19th June, 1871), on your report for the year 1870-71, and to request that the reasons for these omissions may be explained.

9. Your remarks in para. 17 as to the ill-success attending the system of packing the bulbs in hermetically sealed tins will be communicated to the Government of India.

10. *Para.* 29.—The results of the experiments with the European machinery received from Her Majesty's Secretary of State, and the comparative statements of the cost of hand and machine labour, are interesting, but it is feared that it is at present premature to hope that these machines will be of use to the small cultivators of Northern India. The winnowing

machine is perhaps the only one that fills a want which hand labour cannot supply.

11. The accounts of the year show the following result:—

	Budget allotment.	Net receipts from sale of plants, &c.	Total receipts.	Expenditure.	Balance.
Saharunpore garden, ...	9,060	2,297	11,357	11,357	...
Mussoorie garden, ...	792	529	1,321	1,321	...
Hawul Bagh, ...	600	271	871	871	...
Contingencies, ...	3,500	...	3,500	3,500	...
Amount sanctioned for purchase of Cape and American seeds, ...	400	...	400	400	...
Cinchona establishment, ...	5,627	...	5,627	5,627	...
Rhea establishment, ...	2,350	...	2,350	2,350	...

12. The receipts from the sale of plants and seeds, &c., have increased as compared with last year, while they have not yet reached the realizations in 1869-70. The comparative figures stand thus :—

1869-70.	1870-71.	1871 72.
Rs. 3,954-0-11.	Rs. 2,581-4-0.	Rs. 3,098-3-6.

The whole of the sum thus realized was spent on miscellaneous charges connected with the general improvement and maintenance of the gardens.

13. In conclusion, I am to convey to you the thanks of the Lieutenant-Governor for your successful conduct of the interesting operations connected with these gardens.

Art. XXI.

BOOKS SUBMITTED BY NATIVE WRITERS.

1.—MEMO. No. 14, *by* DIRECTOR OF PUBLIC INSTRUCTION *on an Urdu Manuscript entitled* MAHBUB-UL-QULUB, *of* 218 *pages: by* BISHESHWAR PERSHAD, *of Gyanpore School.*

THERE is an English Preface to this manuscript, in which the author states that he wrote the book for the instruction of his son Ram Das, and that his object is to teach the advantages of the freedom enjoyed by Her Majesty's subjects in India, and of education, and to point out the way of gaining a livelihood thereby. It is written by way of question and answer, Ram Das being the second person in the dialogue.

The contents of the work are multifarious, as appears from the table at pages 7, 8, 9, and 10.

They are as follows:—

1.—The advantages of Education.
2.—School and College studies, p. 14.
3.—The advantage of learning English, p. 25.
4.—Hindoostani Manners, p. 28.
5.—Letters on Education, p. 39.
6.—Female Education, p. 53.
7.—Exercise and Labour, p. 60.
8.—Kind treatment due to Women, p. 68.
9.—English Manners, p. 74.
10.—The folly of wearing Ornaments, p. 81.
11.—Evil of Drinking, p. 94.

12.—Knowledge better than Light, p. 99.

13.—Right to pay Taxes, p. 104.

14.—Disagreeables of Service, p. 121.

15.—Delights of Freedom and Independence, p. 125.

16.—Sir Thomas Clarkson on Emancipation of Slaves, p. 128.

17.—Howard the Philanthropist, p. 131.

18.—English Officials serve from a sense of duty, p. 133.

19.—Education necessary, p. 134.

20.—Short review of Indian History, p. 139.

21.—The reason why the English came to India, p. 144.

22.—After this world, think of the next, p. 145.

23.—On business and a livelihood, p. 153.

24.—The value and use of time, p. 156 (in verse).

25.—Benjamin Franklin, p. 161.

26.—On "Promotion" and Prizes, p. 163.

27.—Extravagance in Marriages, p. 164.

28.—Travelling and Cautions, p. 173.

29.—Friendship, p. 178.

30.—The advantage of keeping up high class Education, p. 181.

31.—New way of speaking any language, p. 186.

32.—Fourteen different kinds of knowledge described, p. 189.

33.—On the Urdu language, p. 200.

34.—Various courses of study in Government Schools, p. 204, Courses in Medicine and Law.

35.—Duties of life from birth to death, p. 208.

36.—Duties to Parents, p. 210.

2. This is an original work, except in some few parts (such as sections 16, 17, 20, 21, 22, 23, 24), and is written with considerable *naïveté* and freedom, though it contains mistakes in matter and expression. Section 9, p. 74, is very amusing. The writer knows nothing of English habits. Among other curiosities, he says the English eat with a fork and a penknife. They sit to their meals in order that the food may have a ready transit into the stomach. They don't waste time over their food, but eat often and little at a time, in order that work or business may not be interrupted. In England they live in hotels, and don't have kitchens, because kitchens are taxed. In buying and selling they offer a great contrast to the Natives of India, who waste a great deal of time in quarrelling and bargaining. Every article is ticketed, and you lay down your money and take your purchase without a word. Section 2 is also an amusing survey by Ram Das of what he has learned at the Tehsili School, with a hit or two at the methods of the old Persian schools.

The following will convey some notion of the dialogue between the boy and his tutor, who is the teacher of the Tehsili school, and wants his son to learn Persian at a private seminary:—

R.—"I don't want to go there. The boys learn like parrots, and know nothing of the meaning. They forget their lessons and get beaten. I wish to go to a College. See now if I don't remember the *Haqaiq-ul-Moujudat*; you may ask me any question you like."

T.—"No, no; you go to the *makhtab*. All the mohurrirs, lalas, and babús were taught there."

R.—"I don't say they were not, but all they know is a little Hindee, and they can read and they write Persian like bankers' clerks. Ask them something out of the *Haqaiq-ul-Moujudat* and they know nothing. It seems to me very useful to learn Urdu, one's own vernacular. I now know something of Urdu, and read History and Geography, and have learned Arithmetic, can do the house accounts, and write to my friend Juggoo in Mirzapore, and copy out my translations. I have learned from my Urdu grammar all about *ism*, *fil*, and *harf*, and can parse a little. Only yesterday I asked the moulvie about some words in the *Ruqa'at Nizamia*, which I was reading with him. He

said "what have you got to do with the words? You learn the sense." But when you taught me you explained the derivations and forms of words, the *sulásí mujarrad, mazid*, and other models, &c."

T.—"Ah! when you come to read Arabic grammar with the moulvie, then you will learn all about the forms."

R.—"Yes, but one wants the age of Noah to learn this Arabic grammar; why should not the process be shortened? From the little Urdu grammar I know now I can tell the forms of words derived from the Arabic and Persian. Thanks to you, I have learned this in a single year. In the *makhtab* they spend six years over the *Gulistan* and *Bostan*."

T.—"Yes, it is so, certainly."

R.—"Then, again, history. You taught me the *Ainah-i-Tarikh Numa*, and I no longer care for story books. I like geography, too. I thought there was no other town in the world than Gyanpore at first, and that Beni Madho's musjid was the finest building in India. Now I know about the Taj at Agra, and other fine buildings. I can tell you the distances from place to place, and about the railway and roads, the staples of various towns and marts, &c. Yes, and I know two books of Euclid, and can reach home quickly, when I am out walking by taking the geometrically shortest cut. A boy bet me the other day I could'nt catch him. He ran in the circumference of a circle, and I took the line of the chord, and soon caught him. I can tell you the shapes of places and buildings, &c., &c.," and thus the boy runs on, keeping in this section the talk to himself. In the others it is the teacher chiefly who speaks at length. The tone of the author throughout is that of a Hindoo Kayasth, happy in his profession of teacher, a thorough believer in the blessings of a settled Government, quite conscious of the failings of his countrymen, and anxious to promote the educational system of Government as the best means for the spread of enlightenment. In the view of a Mahomedan scholar both the treatment of the subject, the subjects and the diction are all *wáhiyát*. The cautious criticism of a Moulvie to whom I showed the manuscript is "*mere nazdik yeh kitab kuchh ziyadah kárámad nahín malúm hoti.*"

3. As regards the style and diction, the manuscript is carelessly written, and there are offences against usage and idiom, according to the best models, but the mistakes are not very numerous, and there is nothing objectionable in the matter, except that in Section 8 the expressions used in reference to the advisability of the remarriage of widows are rather coarse, and there is unnecessary particularity in naming the venereal

diseases consequent on a profligate life. If the book is printed, all these matters should be struck out.

4. The author, in my opinion, deserves encouragement; perhaps a prize of Rs. 150 would be suitable, with a promise of purchasing copies of the work if properly brought out.

2.—*From* SECRETARY TO GOVERNMENT, *North-Western Provinces, to* DIRECTOR OF PUBLIC INSTRUCTION (No. 77A).—*Dated Nynee Tal, the 23rd August*, 1872.

I AM directed by the Hon'ble the Lieutenant-Governor to acknowledge the receipt of your docket No. 1314, dated 10th August, 1872, and its enclosed Memo. containing your opinion on the Urdu work entitled "Mahbub-ul-Qulub," by Bisheshwar Pershad of the Gyanpore School.

2. His Honor considering that the work will be read with interest at any rate by the scholars of Government schools, and that its scope will no doubt prove useful, approves of your proposal to grant a reward of Rs. 150 to the author. Copies of the work may also be taken for prizes in the schools if it is properly printed, and the objectional parts omitted.

3.—MEMO. NO. 26, *by* DIRECTOR OF PUBLIC INSTRUCTION *on an Urdu manuscript entitled* TAMBIH-UT-TALIBIN, *of* 166 *pages: by* MAHOMED MUBARUK ULLAH, *Muttra.*

THIS is a work on morals. It treats of the general topics of etiquette with examples, and is divided into an introduction and 21 chapters, which the author calls "Cautions," illustrated by stories.

The introductory portion of the work is a brief comment on the state of Hindu and Mahomedan society in India. The author praises his good fortune on being born under such a liberal Government as that of the English, which has supplied

the means of education to its subjects. He then eulogises the Queen, the Lieutenant-Governor, and the Director of Public Instruction as usual.

Caution 1st recommends the boys to abstain from the company of the ignorant, and act according to the advice of the learned, and proceeds with the following story:—There lived a merchant who had brought up a parrot with great care. Once having occasion to take a journey, the members of his family begged him to bring them each a present. He asked the parrot if he would like something too. The bird declined with thanks, but asked his master to convey a message to his fellows in a certain forest through which the merchant was to pass, to the effect that he lived in a cage while they enjoyed fresh air and liberty. Coming to the forest the merchant saw a large tree swarming with parrots, and delivered his message. The parrots heard the message in silence and dropped down lifeless to the ground. On arrival at home he related the story to his own parrot, who also dropped down apparently lifeless. The merchant threw away the body of the dead bird with great sorrow at its loss, but the parrot reviving flew away to join its companions without regard to the solicitations of the merchant. The moral is that the education received by the parrot proved advantageous in enabling it to effect its escape. Cautions 2nd and 3rd find fault with the familiar speech and quarrelsome disposition of the vulgar. An ignorant man calls out ارے دادا — ارے بابا which are, in the author's opinion, inconsistent with good manners.

Caution 4th likens 'knowledge' to an enormous city, where magnificent edifices and valuable apparatus are supplied, and able Múnshis and Moulvies instruct their pupils.

Caution 5th says that boys should be instructed slowly, and not burdened too heavily at once.

Cautions 6th, 7th, and 10th urge on the parents the necessity of giving advice to their children, and sum up with 19 precepts. The stories in this section are good.

Caution 8th says that anger is the result of ignorance, and illustrations are given (pp. 46-53).

Caution 9th comments on the fondness of boys for kite-flying and other amusements.

Caution 11th explains the excellence of good manners.

Caution 12th censures pride.

Caution 13th remarks on the condition of those who receive good advice from their friends and acquire knowledge.

Caution 14th divides boys of the time into young (بالغ) and childish (نابالغ). The errors of the former, the author says, may be corrected by association, but those of the latter are incurable.

Caution 15th advises the study of Urdu poetry, and recommends the society of poets, also Hindee enigmas for improvement in the vulgar speech, and adds an expression of regret that the sons of the wealthy learn little or nothing.

Caution 16th compares bodily grace with excellence of the soul, which consists in good morals.

Caution 17th condemns hooka smoking as the root of many evils, debauchery, gambling, theft, &c.

Caution 18th suggests the advisability of female education, and relates two or three stories in support.

Caution 19th points out the evils consequent on extravagance, especially in marriage expenses, and suggests measures for effecting reduction.

Caution 20th enjoins the performance of reciprocal duties, such as salutation, politeness, readiness to help, &c.,

Caution 21st recommends the plan of committing stories and proverbial and idiomatic phrases to memory as a quali-

fication for polite society, and he adds a list of these ranged in alphabetical order.

2. The work is original, and some of the remarks made on the duties of a teacher are particularly good. The stories are well told, though often somewhat pointless, like the one epitomized above. The anecdote of the King of Sweden at p. 39 is a good specimen of the writer's style, which is unartificial and colloquial. In places it is awkward and incorrect. I think a reward Rs. 150 would be appropriate, with promise of purchase of 150 copies if properly brought out.

4.—MEMO. No. 27, *by* DIRECTOR OF PUBLIC INSTRUCTION, *on an Urdu Manuscript entitled* RISALAH FAIZ-I-AMM, *of* 163 *pages: by* SYUD TAHAWUR ALI, *Teacher of the Kurra School, Allahabad District.*

THIS is a work on popular Astronomy according to current Mohamedan notions on the subject, but the author states that he gives the explanation of the revolution of the heavenly bodies according to the ancients, not because it is actually true, but that their views on the subject may be known. For this reason he adds مجازاً or بظاہر to the phrase "motion of the sun," to guard against the supposition that he holds the old theory to be necessarily true.

The contents of the work in detail are as follows:—

Introduction.—The sphericity of the earth, and its revolution, with the usual illustrations in proof of the former. The Pythagorean and Ptolemaic systems. The theories of centrifugal and centripetal action.

Chapter I.—Great and small circles, the poles, division into degrees (without figures or diagrams).

Chapter II.—The horizon (Nothing is said of the difference between the visible and the true horizons).

Chapter III.—On the equator and equinoctial.

Chapter IV.—Meridians and lines of longitude, and the method of drawing them (one diagram, page 32).

Chapter V.—Parallels of latitude, and the mode of finding solar and sidereal altitude (one diagram, page 39).

Chapter VI.—The determination of the longitude of places by finding the difference of the times when the sun reaches the meridian as compared with the time at places where the longitude is known.

Chapter VII.—Determination of the earth's circumference and volume from the observed altitude of the polar star at two places on the same meridian.

Chapter VIII.—Means of finding the bearings and distances of towns from observed latitudes and longitudes, and from maps (four diagrams).

Chapter IX.—The torrid zone, and equality of the days and nights at the equator.

Chapter X.—The temperate zones; oblique incidence of the sun's rays; the equinoxes.

Chapter XI.—The frigid zones and apparent motion of the sun parallel with the horizon, and consequent extension of days and nights.

Chapter XII.—The north and south declination of the sun (five diagrams).

Chapter XIII.—Abstract of the descriptive geography of the world, with area, population, and capitals of the various countries. The "seven climes" according to the Mohamedans, with diagram (page 128).

Chapter XIV.—The stars, planets, comets, eclipses. At page 141 a list of the eclipses for the next 30 years visible in the longitude of Allahabad is given.

The Conclusion—Contains questions and answers illustrative of astronomical calculations.

2. From the above list of contents it will appear that the practical rather than the scientific theories of astronomy have been discussed. It is in fact the astronomy of old times, as elaborated by observation without the use of optical aids, and devoid of the exactness and nicety of modern calculations. Very little is said about the moon. Parallax is not explained, and the precession of the equinoxes and other niceties are untouched. At the same time the author seems to know something of modern astronomy, for he alludes to the discoveries made by the telescope, and the appearance and period of comets. The book is interesting, for ancient astronomy is the most wonderful of the remains of the science of past ages. With unscientific theories, and unaided by instruments, its professors obtained their results from accurate observation and registration, which is the basis of all true science. But inasmuch as modern astronomy is more systematic, and leaves less doubtful and unexplained, I should prefer for vernacular teaching a translation of some English popular work on the subject to a revival of the notions of the past from Arabic books.

3. The language of the book is poor and careless, but the author deserves encouragement for the painstaking he has displayed. Scientific acquirements are not supposed to be common among our vernacular school teachers, but here is a man who knows what many of his fellows in a higher rank of official life are utterly ignorant of, and who shows an intelligence and comprehension which make him an ornament to his profession. It may be said that any one with a knowledge of Arabic could serve up a vernacular dish of the contents of scientific books in that language, but it is not every one who could put the subject intelligibly, or explain as he does the meanings of the technical terms employed. In this respect he offers a striking contrast to the translators of English works on medical science, who generally use the English technicalities

with no attempt at exposing their meaning. Perhaps a reward of Rs. 200 would not be out of place, and if the work is published 100 copies might be taken for use as prize-books for the first class boys in Tehseelee Schools.

5.—*From* SECRETARY TO GOVERNMENT, *North-Western Provinces, to* DIRECTOR OF PUBLIC INSTRUCTION (No. 132A.).—*Dated Nynee Tal, the 5th September*, 1872.

IN reply to your letter No. 1596 dated 20th August, 1872, I am directed by the Hon'ble the Lieutenant-Governor to sanction the grant of a reward of Rs. 200 to Syud Tahawur Ali, Teacher of the Kurra School, in the Allahabad District, for his work on popular Astronomy entitled "Risálah Faiz-i-amm."

2. The work will no doubt prove useful as giving an intelligible account of the old system of astronomy and popularizing the terminology in the vernacular, and the author may be commended.

3. You are authorized to take 50 copies of the work if published, but His Honor would not distribute them as prize-books because the recipients might look on the work as authoritative rather than historical. They should be placed in the Libraries of colleges and schools.

6.—MEMO. No. 30, *by* DIRECTOR OF PUBLIC INSTRUCTION, *on an Urdu Manuscript entitled* TALIM-UN-NISWAN-I-HUNUD, *of 55 pages foolscap, by* MOONSHEE CHATUR BHOJ SAHAI, *Beawr.*

THIS writer has endeavoured to imitate the *Mirát-ul-arús*, the merits and usefulness of which he cordially acknowledges, so far as female education among the Mahomedans is concerned. But he thinks that Hindu women labour under disadvantages which are not so much felt in Mahomedan families.

1.—Mahomedan females are always required to learn religious books by heart, and thus acquire a good pronunciation.

2.—Marriage of cousins is customary, so that girls seldom remove to a distance from their homes, and thus keep up the habits they have formed.

3.—When the parents are ignorant, as is widely the case among Hindus, the children remain so.

4.—Hindu girls marry into distant families.

5.—The Shastras prohibit marriage between blood relations.

He also alludes to the dread which exists even among educated men of leaving old paths and adopting innovations, but hopes that the perusal of his book will tend to show the advantages of female education so clearly as to encourage its adoption, notwithstanding existing prejudices.

The story begins at page 5. Pundit Deo Dutt, of Benares, has a son whom he has brought up in the usual learning of his class, but he bethinks him of the advantages of modern education, and the example of success and honour achieved in life by Brahmins of his acquaintance who studied at the Government Colleges. Among these he mentions the late Pundit Sheo Dín, Chief Minister of Jeypore; Pundit Roop Narain, of Ulwur, and the confidence reposed in him by the Political Agent; Pundit Rao Manphul, C.S.I., of Bikaneer; Jani Behari Lall, of Bhurtpore; Pundit Bunsi Dhur, of the Agra Normal School, and Pundit Koonj Beharee Lall, the Deputy Inspector of Agra. He therefore enters his son Bidya Dhur at the Benares College.

The scene then changes to Muttra where another *élève* of the Agra College, Pundit Mohan Lal, is Kotwal. He has a daughter, Bidyawati, who has been well educated سات آٹھہ برس کي عمر تک هر ایک بدیا اور گن مین هوشیار هوگئي and whom he is determined to marry to no one but a youth of character and edu-

cation. He writes to his friend, the Headmaster of the Benares College to enquire if he can recommend such an one, and the Head-master replies that Bidya Dhur is one among five hundred, well-born and bred, clever, and good looking. The horoscopes of the two are compared and eventually the marriage is agreed upon, and the bridegroom elect goes to Muttra for the *rauna* ceremonies, and all are pleased with him. After this, Bidyawati resumes her studies, and assembles girls and women from among her neighbours for profitable discourse and instruction (p. 12.). Some of the ladies relate their past folly and painful experiences. One of them (p. 21) relates how she was swindled of Rs. 500 by a pretended saint at Bindrabun, who professed to have the power of giving children to barren women. She crept out of the house by night secretly, and sold all her jewels, and in the morning invented a story that thieves had been in the house. Another relates the harm she got from a quack to whom she resorted on a similar errand, so that she was at last obliged to call in the aid of the English doctor. Others tell of the death of their children, and the foolish devices they had resorted to in vain to save their lives in small-pox, &c., which introduces remarks on vaccination. Other foolish customs are animadverted on. Bidyawati's father one day finding them thus employed suggests that they should write essays on the evils attendant on extravagance at marriages and funerals. These essays are given at p. 35 to p. 46.

At p. 46 the departure of Bidyawati to her husband's home (*gauna*) is described after an interval of five years has elapsed. She is happy in her husband's home, and has a family of two sons and a daughter. The book concludes with an account of Bidya Dhur's cousin, Murli Manohur (p. 51), who falls into misfortune, but, though a Government employé, resists the temptation to take bribes after the usual fashion of his countrymen, many of whom receive a salary of Rs. 5 per mensem and spend two hundred. He corresponds with his cousin on the subject of his debts, and the impending misfortune of a

daughter's marriage, and Bidyawati writes him a letter advising him not to allow of the extravagance usual on such occasions.

2. The language of his work is that of a Hindi rather than an Urdu scholar. There are many common Persian and Arabic words and phrases, but there are numbers of Sanskrit and Hindi words which never occur in ordinary Urdu, and would be beyond the comprehension of any but Hindi scholars. Even the conjunction परंतु is used, and such words as समर्थ समान संसार नमस्कार परमात्मासज्जन प्रताप ब्यालू &c., occur frequently. As intended for Hindu readers only, the writer would have done better to use the Hindi character.

The contents are good, and the narrative is interesting, and though not so well contrived as the *Mirat-ul-arús*, the book will be read with interest and profit by women and girls who can read, and be heard with profit by those who are too old or too prejudiced to learn.

I think the author well deserves a reward of Rs. 300, and the purchase of 500 copies of his work if brought out in well printed or lithographed Hindi characters.

7.—MEMO. NO. 33 *by* DIRECTOR OF PUBLIC INSTRUCTION, *on an Urdu Manuscript entitled* MAKHZAN-I-ULUM, *of* 85 *pages: by* LULTA PERSHAD, *Master of Mission School, Bacongunge, Cawnpore.*

THIS work is a popular treatise, translated from English, on the following subjects by way of question and answer:—

Lesson 1.—The natural properties of matter.
„ 2.—Motion, page 11.
„ 3.—Mechanical Powers, p. 28.
„ 4.—History of Mankind, p. 43.
„ 5.—The Human Body, p. 54.
„ 6.—Mind and Brain, p. 68.
„ 7.—The Vegetable World, p. 78.

The first of these lessons explains six properties of matter, *viz.*, ممکن التقسیم یا عدم هلاکت — صورت — وسعت — ممتنع التداخل — جذب — مجہول The first of these terms, means impenetrability, which is explained by saying that one body only can occupy one place at one time.

The 5th term expresses the property by which a body once set in motion will always move unless checked by the action of friction, resistance of the air, &c.

The 6th term means attraction, but is used here in the sense of چسپیدگی cohesion; جذب ثقل or gravitation, is explained in the next lesson.

The second lesson explains motion, force, gravitation, momentum, elasticity, illustrated by the impact of ivory balls suspended, or on a billiard table (p. 19). The parallelogram of forces, centre of gravity.

The 3rd lesson explains the use of the lever as applied in the balance, moving of ground weights, &c., according to the position of the fulcrum, with reference to the power and the weight, the simple and compound pulley, wheel and axle, inclined plane, wedge, screw, with illustrations, except in the case of the last, which is no doubt difficult to manage, and the author's drawing powers are evidently limited (see p. 39). The explanations are tolerably clear, but for the lever, at least, native practice might have supplied him with the means of showing the use of the instrument. He transliterates the words "lever" and "pulley," but Native terms such as اتھنگن might have been added to give force to the meaning: for pulley دھر اور پہیا (the rope and wheel) which he uses for wheel and axle would have answered; for "wedge" he has the common term پچر and for inclined plane ترچھا تختہ.

The 4th lesson describes the difference between men and other animals, and the progress of civilization. Egypt, Arabia,

Persia, Syria, and Greece are mentioned as the first abodes of civilization. The Jews are also said to be known for their reliable history, and the Greeks and Romans for their learning. The account then passes to the re-appearance of civilization شايستگي after the middle ages. The nations who eat flesh, and the various animals they eat (dogs, rats, horses, elephants, wolves, jackals, badgers, &c.) are named next, and an account follows of the savage and uncivilized people of modern times, the religions of the world, and the kinds of Government.

The 5th lesson describes the human frame and its bones, and part illustration of a skeleton (pp. 56-57,) the circulation of the blood, &c.

The 6th lesson explains the functions of the mind and brain, the senses.

The 7th lesson shows the difference between vegetables and animals; the sap, leaves, seed; the four chief species of plants, grains, grasses, bulbs, and trees.

The diction of this work is not particularly elegant, and would bear a great deal of revision. The matter is very simple and useful, and is suited to the "question and answer" form of conveying knowledge.

The tract would bear publication after review, and would be a useful prize-book for Vernacular schools. I think the author deserves encouragement,—say a reward of Rs. 100.

8.—MEMO. NO. 35 *by* DIRECTOR OF PUBLIC INSTRUCTION, *on an Urdu manuscript entitled* TASHRIH-UL-FARAS, *of* 121 *pages: by* MOONSHEE AJOODHIA PERSHAD, *Bareilly College.*

THIS treatise, as the title implies, is an account of the horse. The following are the contents briefly abstracted:—

A description of the noble characteristics of the animal, and his innocent freedom in a wild state (pp. 3—7). The wild

horse of America, imported by the Spaniards from Europe, seen by a traveller in 1685 in the neighbourhood of St. Louis, also in St. Domingo. The Lasso. The rearing of colts; early weaning necessary. Breaking horses. Use of bridle, spur, &c. The paces, the walk described, and the alternate action of the feet noticed as necessary for the proper equilibrium of the centre of gravity. Four movements in the walk; two only in the trot; three in the canter (which reminds one of Virgil's dactylic representation of the gallop); the amble (p. 21.) unnatural—popular in India.

The points of a "fine, faultless horse":—The head small; face clean looking; ears small, and well placed; eye-balls neither large nor small; forehead medium size and full; temples puffy; eyelids thin; the eye clear, kind, bright, and large; the jaw not coarse; the nose clean—cut like an eagle's beak; the nostrils large and open; the lip thin, the mouth moderately broad; withers high; shoulders lean, flat, and free; back level; barrel full; quarters round, and plump flanks, well sloped; root of tail thick and firm; forearm stout and fleshy; knees round in front; the joints large, cannon bone small and strong; fetlocks free from hair; the hoof well raised, hard, shining, and shapely; the foot broad below, well hollowed in the centre; the frogs small.

Bad points of a horse:—Period of life about 18 years (the author says that the length of an animal's life in its natural state is always six or seven times the period in which it attains maturity, so that the horse ought to live 24 or 28 years). The earliest habitat of the horse probably a warm country, which is best suited to their nature, such as the open plains of Africa, Arabia, and Tartary. Arab horses, and the way in which they are caught and trained; the value set upon them by their owners. (Among other things it is said that an Arab never feeds his horse by day, but gives him a *tobra* of 15 or 16 seers of gram to eat at night). Letter (translated) from Mir Abdul Qadir Khan to M. A. Dainas (*sic*), dated August, 1857, Damascus, on the subject of Arab horses (pp. 40-52). Horses

of Barbary, Mauritania, Gambia, &c., of Spain, Italy, Germany, France, India, Persia, England. At page 71 a curious list of the qualities of a good horse is quoted. It is to be like a woman, lion, sheep, deer, wolf, fox, serpent, and hare, each in three several particulars. Pages 72-81 contain various interesting particulars as to food, growth, age, &c., followed by a notice of the good and bad colours, and the fancies attached to them. At page 87 some 30 equine disorders of the eye, head, mouth, &c., with remedies, are shortly treated.

2. This is a very interesting little book, exceedingly well written, and though taken chiefly from English books, thoroughly idiomatic and natural. Except for the names of men and places, there is no idle transliteration of English words. The author has taken the trouble to find out the correct Native nomenclature in matters relating to the horse, a large proportion of the words being pure Hindee. I could wish he had extended his inquiries further and illustrated his subject by references to Native works on the horse, which exist both in Persian and Hindee. Anyhow in this manuscript we have a popular subject well handled, and the writer deserves encouragement. In my opinion he well merits a prize of Rs. 200, and may be encouraged to publish his manuscript.

9.—MEMO. NO. 45 *by* DIRECTOR OF PUBLIC INSTRUCTION, *North-Western Provinces, on an Urdu Manuscript entitled* AINAḤ-I-KHIRD, *of* 123 *pages: by* ABDUR RAHIM, *Agra.*

HAJI Hatim and Durga, two school-mistresses of Phulwari, in Behar, a village known for the intelligence of its inhabitants, assembled the Hindoo and Mahomedan girls to listen to a conversation between themselves on matters connected with female education and the duties of women, and on the benevolent character of the English Government. One of the girls is supposed to take down what passes, and the other gives the conversation and speeches according to the report thus made (p. 5). The questions are simple, *viz.*, the advantages of educat-

ing girls at home when young, their deportment in married life, which requiries علم as well as عقل (*vide* a rather amusing story at p. 30), the fearlessness of honesty بےقصور بےخوف kindness to enemies, unfairness, fidelity, habit, improvidence, contentment, revenge, names of the months and eras, the benefits of the English rule. Most of these topics are illustrated by simple tales, and the whole is written in an easy, unpretending style, with instances of the female idiom in colloquial use. The mistakes are not numerous or important, and if the manuscript is corrected and published, the book will be useful for a prize-book in girls' schools. The author might receive Rs. 100 for his manuscript, which we can then publish. The title should be چشمۂ خرد not عینک خرد

10.—*From* SECRETARY TO GOVERNMENT, *North-Western Provinces, to* DIRECTOR OF PUBLIC INSTRUCTION, *North-Western Provinces* (No. 152A.)—*Dated Nynee Tal, the 7th September*, 1872.

I AM directed to acknowledge the receipt of your docket No. 1715, dated 27th August, 1872, submitting a Memo. on a book entitled "Ainak-i-khird," by Abdur Rahim, of Agra, and to state that His Honor has special pleasure in according the reward of Rs. 100 recommended by you to the author.

2. The book is one of a class which, though easy in appearance, requires labour and skill to combine simplicity and the daily speech of household life with literary propriety, and His Honor has no doubt that the work will prove most useful and acceptable in female schools.

3. At page 87 the story inculcating the getting rid of enemies by deceit should either be removed or modified, as the principle held up for imitation is not laudable.

4. Copies may be subscribed for to be distributed as prizes in girls' schools.

11.—MEMO. No. 19, *by* DIRECTOR OF PUBLIC INSTRUCTION *on an Urdu Tanslation of* BUTLER'S ANALOGY, PART I: *By* MR. WILLIAMS, *St. John's College, Agra.*

I OBSERVE that the introduction has been left untranslated. The only part of it which has been preserved is the quotation from Origen, given at the foot of the manuscript title-page.

I have not examined the whole of this translation, but have confined myself to testing the chief portions of each chapter, selecting the more difficult and involved arguments, on which close attention to the logical sequence of words and phrases is absolutely necessary. The translator has followed the original with great faithfulness and literalness. Very few ideas are left unexpressed, and there is rarely any attempt at periphrasis or modification of the turn of thought to suit Oriental idiom. To attempt to clip the original would have been to destroy the sense, but there is no reason why that sense should not be expressed with greater freedom in places where a bold literal version is almost unintelligible without a reference to the English book. Inversion of clauses is almost the only device to which the translator has had recourse in the way of adaptation, though I observe he sometimes merges explanatory clauses in the principal sentence which precedes them. His great difficulty has been the choice of equivalent terms for the philosophical expressions and appellatives which are arrayed with such exact appropriateness in the Analogy; and this has led to the various use of what are assumed to be convertible terms by the translator. He has evidently felt doubts about the appropriateness of his equivalents, and, by using others, hopes to arrive, by an accumulative process, at a true representative of the meaning of the original words. But it is obvious that this method is fatal to a logical sequence of ideas in the mind of the reader, who can never be certain that precisely the same thing is intended. Butler never falls into this confusion, and if he uses a convertible term takes care to explain. As an instance of what I mean, I notice the word

"natural" as explained and dwelt upon at the end of Chapter I.

Far in the next chapter the author makes an obvious allusion to this discussion, and uses the word with special reference to it; but the translator gives different words, and thus obscures the allusion. In his preface the translator states that he undertook the translation two years ago, but laid it aside on account of the want of "philosophical expressions in Urdu." He resumed work after reading two works on moral philosophy, one of which was the *Akhlaq-i-Jalali*. This was not enough. He should have had recourse to books of physical science also, according to the Oriental school. No doubt Moulvi Bashir-ud-din was able to supply the want in some degree, but his ignorance of English was a bar to any nice determination of equivalents. And as regards the use made of the *Akhlaq-i-Jalali*, I notice that terms which might have been taken from that work are neglected—*e.g.*, the terms for "resentment" and "perception" as mental powers, and "excess" as applied to what Butler calls "overplus" on the side of virtue, in opposition to "defect."

2. The chief fault of the translation, to my mind, consists in the use of supposed convertible terms, where the argument requires a constant usage of one and the same expression. I might mention several instances of this, but perhaps one will suffice. This is the various way in which "nature" is rendered, *e.g.*, ضابطۂ عالم نظام فطري فطرت عادت إلهي حكمت إلهي &c., and in its secondary sense by سرشت جبلت طبع &c. For "natural" the most frequent term in use is طبعي but بذاتہ is also used, sometimes alone, sometimes with an adjunct as, بذاتہ نفس Another fault must not be passed over, which is the use of the same word to express different meanings, especially when in close proximity. The word صنعت is thus used in the same sentence to express "design" and "work." The "existence of our living powers," "living powers," and "living agents," are rendered by قواے حیات; "consciousness," and "percep-

tion" by إدراک; "capacity," "genius," the "fitness" of things by لیاقت

3. The next objection arises from the use of ordinary words in a meaning they do not possess. Instances of this follow. I do not insist upon each being absolutely wrong, but the majority are doubtful renderings—*e.g.*, إستحالة used for a "difficulty," in argument لذت for "perception;" سرگرمي for "enthusiasm," إنتقال for "alienation," ملکات for "habits," فاضل for "overplus," ناراضگي for "resentment," ستارگ for "chief" (this word means bulky), مزاولت for "exercise" (probably means undertaking the management of), بےمعاوم for "insensibly," تردد for "care" (in an objective sense), جاےظہور for "theatre," ایک طریقہ for "a character," پیش‌خبري for "warning," تطبیق for "reconciling" (this word means bringing things together, but rather in an adversative sense), پسندیدگي for "choice," ترجیح for "preference" (rather pre-eminence), بےپایاني for "immensity" (rather incompleteness), إلحاد for "infidelity" (the word means unbelief in Islam), ملحد for "atheistical," عموماً for "promiscuously," کثرتیں for "exercises," قطعاً for "demonstrably," قضیہ for "proposition" (perhaps this may pass, but the word means syllogism in *Mantiq*), تفویض for "committing" to a superior (I rather think it is confined to committing to an inferior).

4. Another class of feeble or mistaken renderings arises, from the endeavour to be terse and literal, and from a want of effort to grasp the full idea. Among such I may instance, taking the English from the original بہت سے شکوک for "a general confused suspicion," مرگ کي تبدیل for "alteration caused by death," مرگ کي نزدیکي for "the near prospect of death," اِس معاد کي حیات افضل یقین کي وجہ for "the ground of this certainty," for "a better life" (here the literal sense of معاد seems to forbid its use in the Christian sense), عدالت قاسمہ for "distributive justice," ناکامیابي کے اصل خطرہ for "the real danger of miscarrying" (danger meaning likelihood), ایک پیدایشي احمق for "an idiot" (taken from the expression 'a born fool'), زندگي

خانگي for "domestic life," زندگي آيندہ کي طياري for "preparation for a future life," اطاعت اِنفعاليہ for "passive obedience," کوئي شی غير همارے for "somewhat external to ourselves," اِس راے پر هو جانا for "to conclude" (evidently from, "to become of this opinion"), اندیشہ اور حيا کے تعرضات for "the restraints of fear and shame" (there shame does not mean modesty as حيا does), بطريق وجدان for "intentively," بہ اِحتياط for "in a lax way of speaking," معاملات عملي ميں اِستعمال for "applicable to practical subjects" (here the common origin of the two first words has been forgotten), زمانہ پاستان for "in a late age" (late here means recent), اُسي قاعدہ عام اور واحد ميں for "under one and the same general law," بلحاظ همارے اخير اور فائدہ سترگ کے for "with respect to that chief and final good."

5. A few specimens of sentences taken here and there at random from among those which attracted my attention as wanting vigour and accuracy may be added here :—

(1.) "We are conscious of acting, of enjoying pleasure, and suffering pain," Chapter I. This is translated هم بادراک عمل کرتے هيں اور راحت سے حظ اور رنج سے تکليف اُٹھانے کا علم رکھتے هيں Of which the meaning is:—We act with intelligence, and know to get delight from pleasure, and trouble from sorrow, and the argument that being conscious of acting involves a capacity for action is lost.

(2.) "Perhaps there may be some impossibilities in the nature of things which we are unacquainted with," (Chapter II.) is translated شايد کہ يہہ امر بذاتہ کسي وجہہ سے جس سے کہ هم ناواقف هيں غيرممکن هی

Here the thing with which we are unacquainted is the nature of things, and not impossibilities, which latter seems to be Butler's meaning. The text is important, as the fact of our ignorance forms the basis of the reasoning of Chapter VII.

(3.) "Divine goodness may not be a bare single disposition to produce happiness; (Chapter II.) which is thus— رحمت اِلهي کا يہہ ميلان نهو جيسے صرف خوشي پيدا کرني منظور هو

It is not easy to suggest a translation for the "bare single disposition," but a periphrasis would have been preferable to the solitary میلان

(4.) "They proceed from general laws, very general ones" (Chapter II.), وے قواعد اکثریہ بلکہ عامۃ مستخرج ھیں

It is not easy to see the meaning of this, اکثریہ may mean "generally," but why عامۃ should mean "very generally" is not clear. The word مستخرج is too strong for "proceed." It is often used, I observed, by the translator.

(5.) "A situation advantageous for universal monarchy," (Chapter III.) ایسا مقام سلطنت عام کے لیئے سودمند

The rendering is poor, but I notice it here chiefly to note this misuse of عام in the sense of "universal." The translator, I fancy, had "general" in his mind rather than "universal," but the difference is really very great. Again, as to the use of this word عام it is easy to accept its adverbial significance in such phrases as عام پسند مفید عام but it is doubtful whether such terms as سلطنت عام طریق عام إنتظام عام or even تعلیم عام جواب عام or قاعدہ عام are correct. The translator uses it without hesitation in all these, and in several other conditions, and, so far as usage goes among books of the day, it seems common enough to assign to it the meaning of "general," which I do not think it really possesses; "universal" is certainly a wrong sense.

(6.) "The power of the two last is the power of habits" (Chapter V.), جن دو کا اخیر بیان ھوا اُنکي قوت کو ملکات کہتے ھیں

This is a poor rendering, and I doubt whether ملکات answers for "habits." The singular of this word means, so far as I know, keenness of intellect.

(7.) "Such necessity will itself account for the origin and preservation of all things" (Chapter VI.), یہہ جبر بذاتہ جمیع اشیا کے وجود اور محافظت کا مقتضي ھی

This leads to the mention of وجود as used by the translator indiscriminately for "origin" and "existence," or "being;"

مقتضي so far as I have any acquaintance with the word has nothing to do with "accounting for" or "explaining."

(8.) "And from hence (for this abstract as much as any other implies a concrete) we conclude" (Chapter VI.), اور ازآنجا کہ یہہ غرض مثل اکثر اغراض کے جوهر پر دلالت کرتا هی لهذا یہہ نتیجہ برآمد هوا

This rendering, besides being unintelligible, shirks the meaning.

(9.) "I am very sensible, he could not choose to mean it."—*Ibid.* میں خوب واقف هوں کہ اگر دوسرے معني کا اُسکے نزدیک اِمکان هوتا تو وہ یہہ معني تسلیم نکرتا

Here the translator has unnecessarily perplexed the meaning, which is clear enough from the context.

(10.) "Which run up into the most abstruse of all speculations."—*Ibid.* جو خیالات دقیق کي طرف لے جاتے هیں

In this instance the force of the original is entirely lost.

6. It would be easy to point out other instances of failure, but enough has been said to show the need of revision. On the other hand, it would be easy to cite instances of successful rendering, even in involved passages. The English of the Analogy is too pithy and pregnant for easy transference into a language which consists chiefly, it must be owned, in stringing foreign words together, and which reads abruptly and incoherently in consequence when the attempt is made to translate a work like this. I confess I was quite unable to follow the argumentation as contained in the Urdu version until I compared it with the original. I think better of it after the comparison; and my opinion is that the translator has achieved a commendable degree of success, and one which entitles him to encouragement. Of this His Honor is better able to judge than myself, and I leave to him to determine the amount of encouragement he is prepared to award. The translator has aimed high and taken great pains, and it is of course impossible to assess the value of the assistance he has received from Moulvi Bashir-ud-deen. From the character

of much of the phraseology, and the fact that the translator's own reading does not appear to be extended, the Moulvi's assistance must have been considerable. Mention is made in the preface of a Mr. Campbell; but who this gentleman is, or what his attainments may be as an Oriental scholar, I am unable to say.

The secular character of the part translated, treating as it does of natural religion, and of the moral evidence for a providential government of the universe by "the Author of Nature" would bring it within the scope of the General Prize Notification.

P.S.—Since writing the above, I have received a corrected version of the two first chapters of the manuscript, in the preface to which the translator states that he has endeavoured to remove the "imperfect renderings" and "inelegancies" of the first translation. He has given a list of the principal emendations, some important some unimportant. On examining these, I find the alterations chiefly verbal, and not of a kind which are intended by the remarks made as to the need of revision in the earlier part of this *critique*. In the 5th paragraph, I have quoted four examples of inaccurate or insufficient rendering from a partial inspection of the first two chapters; one only of these has also attracted the reviser's notice.

12.—RESOLUTION No. 911.

GENERAL DEPARTMENT.

Dated Nynee Tal, the 3rd October, 1872.

READ—

A Memorandum from the DIRECTOR OF PUBLIC INSTRUCTION, *North-Western Provinces, No.* 19, *dated 7th August*, 1872, *on an Urdu translation of "Butler's Analogy," Part I.; by* MR. H. WILLIAMS, *St. John's College, Agra.*

OBSERVATIONS.—This translation into Urdu of the First Part of "Butler's Analogy" was presented in pursuance of the private notification in which Sir William Muir offered

rewards for standard Christian works in the vernacular; but so far as it goes, the present translation is confined to that part of Butler's great work which treats of *Natural* Religion. There is nothing in this portion of the treatise which is not shared by Christianity in common with other systems of faith: the argument from the analogy of Nature in favour of the doctrine of a Future life, of Rewards and Punishments, and of the Moral government of the Deity, will be received with approbation by the good of every creed; and, on a perusal of the translation, His Honor finds that it keeps faithfully to the original, and that there is nothing in any of the renderings or allusions which could be objected to on religious grounds by the professors of another religion. This part of the Analogy has also been admitted into the University Course. And, on these grounds, His Honor feels at liberty to treat the work as coming thoroughly within the scope of the Educational Notification, and as eligible for consideration and reward under its provisions.

2. The translator has aimed high, and has in many respects succeeded in rendering with accuracy, and sometimes with felicity, the sense of his author. But the work, from the abstruse character of the argument, and the necessity for the uniform use of philosophical terms, is one of extreme difficulty, and the criticisms of the Director of Public Instruction (in which for the most part His Honor concurs) show that there are serious defects in the translation. Nevertheless, the very considerable degree of success which the translator has achieved is deserving of substantial recognition; and His Honor is not without hopes that, after a thorough revision, this version may be worthy of publication and of being used in our educational institutions.

3. His Honor is accordingly pleased to award a premium of five hundred rupees, and further would hold out encouragement to the translator to revise the translation in the light of Mr. Kempson's strictures. Should it be hereafter published in a materially improved form, its claim to further reward will be considered, and in that case also a number of copies might be subscribed for on the part of Government.

13.—*Memo. No.* 43, *by* DIRECTOR OF PUBLIC INSTRUCTION, *on an Urdu Manuscript of* 167 *pages, entitled* ROUNAQ-I-HIND: *by* MUNSHI HOSEIN ALI, *Vakil, Mirzapore.—Dated Allahabad, the* 22*nd November*, 1872.

THIS is a remarkable production for an orthodox Mahomedan: for so I judge him to be from the tone of his remarks when the religion of Islam is mentioned. It is remarkable for the honest way in which the author admits the superiority of the English Government in all matters which affect the real welfare and prosperity of the country, as compared to the state of things under the Mahomedan supremacy. The liberal way in which education is offered to all is especially noticed, and the rejection of it by Mahomedans is dwelt upon as a lamentable blunder, which, whatever be its cause, is incapable of serious defence. The manuscript was written long before the report of the Select Committee at Benares was issued, or I should have taken it for a reply.

2. The following is an abstract of the author's introduction:—The English Government has now been established for a long time, and yet the people of the country either cannot or will not recognize the benefits they enjoy, as compared with their former condition. The cause of this is their ignorance. Three-fourths of the people are uneducated, and of the remaining fourth not one in ten knows the history of the past. Most think either that the state of things has always been much the same, or that they have come from bad to worse. History, as will be shown, contradicts this foolish fancy. Many, according to their custom, will close their eyes and ears, and say I am writing only to flatter and curry-favour. They are utterly mistaken. I shall speak of what is before everybody's eyes if they choose to see. History shows, with certainty, what grounds there are for concluding that the people were happy or unhappy under the Mahomedan rule, and they, who have any respect for justice and unselfish views, know that the people did not even dream then of the comfort

and prosperity they now enjoy. See what Babar says in his memoirs:—"Hindustan is a country in which the comforts of life are few. The people know nothing of the benefits of society and civilization. They are ignorant, without the bond of fellow-feeling, and incapable of invention. They have bad horses, bad food, and a bad climate. They have no baths, no schools, no light, not even a candlestick." In saying this Babar will hardly be accused of flattery or currying favour. This in very brief terms is the author's preface.

3. The contents of the book are as follow, and I shall give more in detail the part which treats of education from a Mahomedan point of view:—

Chapter I.—EDUCATION.—The condition of Europe is cited as an instance of the effect of general enlightenment produced by the spread of knowledge. The former rulers of India kept the people in darkness.

Section 1.—The subject more fully stated. Former rulers of the country spent nothing from the public purse on education. In Akbar's time something was done, and there were three or four Arabic and Persian schools at the seat of Government, but there was no method. The rich were able to keep tutors, but the poor were helpless. The Emperor Alamgir, who was the ablest of his line, said that the lower orders had no right to education. Another hindrance was the difficulty of procuring books.

Section 2.—Contrast of the state of things under the English rule. Yet even now ignorance is widespread, and the people do not take advantage of their opportunities. The Mahomedans, especially those who are esteemed respectable and intelligent, hold aloof.

Section 3.—There are several reasons alleged by Mahomedans for their unwillingness to learn English. Some say our ancestor Adam and our Prophet Mahomed did not find it necessary to learn English, why should we? According to

this, says the author, if our ancestors fell into wells or got drowned, so should we. Others say, that books and histories are taught in the school which speak slightingly of our religious guides and creed, and since many are ignorant of the doctrines of their own religion, infidelity is likely to occur. All this is fancy and pretence. The objectors would cloak their own folly and ill-condition by an unfair accusation. There can be no harm to religion in reading histories, whose authors merely state events according to fact: they are to be pitied whose faith is so unsuitable as to be disturbed by the perusal of histories which may contain matter adverse to their creed. The Hindoos have just as much cause for complaint, and they attend the schools in large numbers. It is not care for their religion which produces this objection; and as to English being likely to produce infidelity, Akbar, Abulfazl, and Feize were lax enough, and yet they knew nothing about English. Mahomedans study other languages even in India freely, and if it is contrary to the faith of Islam to study the language of a non-Mahomedan people, everybody has erred. The Persian Kings adopted the language of the Guebres, and if Mahomedans generally are willing to study the language of *Kafirs*, why should they refuse to learn English, the language of the Ahl-i-Kitab? Others object that English books teach notions contrary to the traditions of Mahomedan philosophy. They say that the earth moves round the sun, whereas Mahomedans are taught by their doctors that the heavens revolve round the earth. Others say that English is too troublesome a language for their children to acquire; others that they are too poor to pay for the luxury. The fact is, تعصب "bigotry" in matters of religion and in worldly affairs accounts for all.

This subject of "bigotry" (prejudice) is dwelt upon at considerable length.

Section 4.—Female education, and the reasons why it has been neglected. (This is well stated on the whole.)

Chapter II.—Contrast of the articles of food, dress, and luxury in former days with those to be had now.

Section 1.—Statement of the state of things in this respect under the Mahomedan rule.

Section 2.—The state of things now.

Chapter III.—The conveniences of travelling compared.

Section 1.—The insecurity and difficulty of travelling for ordinary people in former times.

Section 2.—The state of things now.

Chapter IV.—The administration of justice.

Section 1.—The methods of the former rule.

Section 2.—The case as it is now—police, jails, &c.—mentioned.

Section 3.—A few particulars of the present administration of the Government generally.

4. The manuscript is so badly and incorrectly written by the author's amanuensis, that I should have suggested its return, had not the subject struck me as interesting in connection with the issue of the report of the Mahomedan Committee at Benares. The author speaks and argues boldly, and attacks the prejudices of his co-religionists unsparingly. He acknowledges, without hesitation, the folly of Mahomedans in holding aloof from the advantages offered them, and thus affords a strong contrast to the Benares Committee, which justifies the course they have taken, and determines on a complete severance from the Government system.

The tract, if carefully corrected and edited, will do good in my opinion, though, as the author says, people *will* close their eyes and ears to argument. Perhaps a reward of Rs. 250 will be a suitable acknowledgment.

14.—*From* SECRETARY TO GOVERNMENT, *North-Western Provinces, to* DIRECTOR OF PUBLIC INSTRUCTION (No. 345A.).—*Dated Camp, Raolee, the 19th November*, 1872.

I AM directed to acknowledge the receipt of your docket No. 1697, dated 27th August last, with which you submit a memorandum containing your opinion on the work entitled "Rounaq-i-Hind," by Munshi Hosein Ali, Vakil, Mirzapore.

2. In reply I am to say that the Lieutenant-Governor has perused the work with much satisfaction.

3. As a practical man of business, engaged in the daily work of a pleader in the Zillah Court of Mirzapore, Munshi Hosein Ali has taken an intelligent and sensible view of the benefits conferred upon India by the English Government, which are brought out in striking contrast with the discomforts, ignorance, and insecurity that prevailed among the people at large under the dynasties preceding British rule. The testimony is all the more valuable as coming from a well-educated gentleman, and a staunch and orthodox adherent of Islam. His strictures though trenchant—perhaps at times too severe—are upon the whole well-advised, and couched in language indicative of the deepest interest in the advancement and welfare of his country; and their publication ought to have a beneficial effect at any rate in opening the eyes of his fellow-countrymen to the injury they are doing their children by neglecting the means of education provided for them by the Government.

4. The Lieutenant-Governor sanctions the reward of Rs. 250 recommended by you to the author, which he well deserves; and if a carefully revised edition of the work is published, 100 copies may be taken for the school and college libraries, and for distribution as prizes.

5. Your memorandum, together with these orders, will be published in the Supplement to the *Allahabad Gazette*, and in the *Selections from the Records of this Government*.

Art. XXII.

EFFECT OF INCREASED POPPY CULTIVATION ON THE USE OF OPIUM.

1.—*From* SECRETARY TO THE BOARD OF REVENUE, *North-Western Provinces, to* SECRETARY TO GOVERNMENT, *North-Western Provinces* (*No.* 234).—*Dated Allahabad, the 4th November*, 1872.

IN paragraph 5 of Government Order No. 13A., dated the 26th of January last, on the subject of the measures necessary for preventing the illicit sale of opium in opium-growing districts, His Honor the Lieutenant-Governor observes that, "it would be highly interesting and useful to obtain satisfactory information as to whether the habits of the people in respect to the use of opium are affected by the extension of poppy cultivation." "This subject," His Honor added, "is one of deep importance as affecting the moral propriety of such extensions, apart from the financial considerations on which the extensions have been based." In respect of the latter, His Honor observes, "that so long as the demand from China continues as it is, the gains from the export trade will, beyond all comparison, outweigh the loss of profits from home sale, but it would be dearly purchased at the expense of the morals of the people." "It has not, however," so far as His Honor knows, "been established by an official document that the use of opium is increased locally among the population which grows it, and the conclusion is not, of course, to be assumed without proof."

2. The Board circulated this paragraph to all Commissioners, with the request that they would favour the Board with

any information which they could furnish on the subject. An abstract of their replies, together with a report* from Mr. G. M. Ricketts, late Officiating Commissioner of Allahabad, and its enclosure, and a demi-official memorandum* by the Officiating Commissioner of Excise, is submitted for the perusal of His Honor.

3. The Board themselves consider that the subject is one in regard to which it is difficult to get any evidence beyond that afforded by the personal observations of local officers, or furnished by inquiry from intelligent Natives, and the presumption afforded by a comparison between the sales of Government opium in opium-growing districts and in districts in which opium is not grown.

4. The presence of opium cultivation affords facilities for the increased use of illicit, not licit, opium, *i.e.*, of opium obtained direct from the cultivator by the consumer, or obtained at a lower price than Government opium sells for by the consumer from the vendor, who obtains his supply from the cultivator. Of this position there can be no doubt. It is a self-evident truth, and therefore requires no proof. The real questions are:—Are such facilities for the increased use of opium taken advantage of by the people among whom they are found to exist? Is more opium consumed by the people in opium-growing districts than in districts in which there is no poppy cultivation? Or has the introduction or extension of poppy cultivation been followed by a more general use of opium?

5. The opinions recorded by the Revenue Commissioners, and by the officers whom they have consulted, vary very widely.

6. The Commissioner of Meerut is inclined to think that the class of opium-eaters and smokers is limited, and that the body of the people do not indulge in the use of the drug. He

* Not printed.

is not aware that the extension of poppy cultivation tends to demoralize the people by inducing them to consume opium. The Collector of Banda, on the other hand, reports that the result of the inquiries made by him shows that there is an illicit consumption in his district, which is caused entirely by the cultivation of the plant.

7. The Collector of Mynpoory infers, from carefully considered premises, that the cultivation of the poppy tends to increase the consumption of opium among the classes that produce it, and people of like position.

8. The Collector of Bijnour is of opinion that in opium-growing districts the consumption of opium, in one form or another, is very great—the drug being so easily procured.

9. The Collector of Moradabad argues that when it is borne in mind that cultivators will keep back part of their produce, it can be readily inferred that a large quantity of opium will be for sale at a cheap rate in the district; and as the high price of opium is the cause of many not using it, it will naturally follow that, when the article is to be had at comparatively a cheap rate, the number of opium-eaters will increase.

10. The Collector of Budaon does not think that as yet the habits of the people in respect to the use of opium are altered to any great extent, although it appears to him that the tendency of local cultivation must necessarily be to increase the consumption, unless illicit sales are completely prevented, and this he does not believe to be possible.

11. The Collector of Bareilly considers that a comparison of the statistics of the sale of opium in years in which poppy was grown, with those of years in which poppy was not grown, establish to some extent the general belief that illicit opium is procurable where poppy is grown, and, when procurable, it is likely to cause an extension of consumption.

12. The Commissioner of Rohilkund states broadly that the illicit sale, and to a certain extent the consumption, must be increased where the cultivation is permitted.

13. The District Superintendent of Police, Goruckpore, observes that the cultivation of opium in that district is very extensive; and though the fact may not be borne out by official records, there is no doubt the consumption is also large,—the extensive cultivation making the illicit consumption so easy.

14. The Collector of Bustee has seen nothing to make him think that the people of his district, where the plant has always been grown, use more opium than they used formerly owing to the extension of poppy cultivation. On the other hand, the Collector of Azimgurh believes that the consumption of opium is on the increase, and that the increase is due in some measure to the extension of opium cultivation, but adds that he is not in possession of reliable figures to test the accuracy of his opinion.

15. The Deputy Collector of Mirzapore reports that everybody he has consulted says that the use of opium is on the increase, but that there are no data for determining whether that increase is connected with the increase in cultivation. The "standard produce" of opium in the Mirzapore District, under the Ghazeepore Sub-Deputy Opium Agency, for the last four years has been as follows:—

	Mds.	*Seers.*	*Chks.*
Season of 1866-67, ...	561	13	3¾
Ditto of 1867-68, ...	593	30	14
Ditto of 1868-69, ...	657	18	0
Ditto of 1869-70, ...	642	30	0¾
Ditto of 1870-71, ...	572	23	11½

These figures would appear to *disconnect* increase of consumption from increase in production; while, on the other hand, it

may be noted that the *reported* produce in 1870-71 is less than that of the preceding years, as compared with the area under poppy cultivation. This fact would tend to the inference that more illicit opium was disposed of in 1870-71.

16. The Collector of Benares, relying wisely rather "on inquiries in several quarters, and on the results of his own observation in place of unreliable or doubtful statistics," has little hesitation in affirming that the extended cultivation of the poppy has not led to increased consumption among the class of Natives who grow it; and that if the extended cultivation has led to an extended local consumption, this has been brought about more by the greater facilities for indulging their favourite taste afforded to that class of the community who have always been more or less addicted to the use of intoxicating drugs.

17. The Collector of Ghazeepore denies that the increased cultivation of opium tends to increased consumption among the growers. His remark, however, is hardly a reply to the question put by Government.

18. The Commissioner of Benares thinks that though the actual growers may not use opium more than before, that the extension of cultivation and increased facilities in obtaining the drug should have the effect of increasing the number of opium-eaters generally is only a natural consequence, especially when the cost of liquor is so great.

19. The Commissioner of Allahabad and the Deputy Collector of Allahabad assume that where cheap opium is brought within the reach of the people, increased consumption of the drug must follow.

20. The Collector of Futtehpore, after showing that the sale of Government opium has increased, owing in the first instance to the high still-head duty imposed on Native spirits, adds:—"The re-introduction and extension of the poppy cultivation is another main cause of the increase of the consump-

tion of opium, but it is next to impossible to establish this fact in the absence of any documentary proof." He also observes that the sale of Government opium increased when poppy cultivation wained, and fell again on the re-introduction of poppy cultivation.

21. The Deputy Collector of Etah has shown that while the quantity of opium produced has fluctuated largely during the last five years, the sale during the last two years has risen; but his figures appear to the Board to be of little value, for the returns of production are hardly reliable when it is so easy for the cultivator to keep back part of the produce.

22. In Muttra, a district in which there is no poppy cultivation, the local consumption of opium has increased to a very considerable extent.

23. Mr. Macnaghten, Officiating Commissioner of Excise, observes, in his demi-official memorandum submitted herewith, that "there can be no dispute that altogether, independent of the extension of the cultivation of the poppy to or in particular districts, there is an increased consumption of opium in these provinces of late years, for the annually increasing receipts from the sale of Government opium prove this:" "but," he adds, "the consumption appears to me to be for the most part confined to towns where it takes the form of mudduk and chundoo."

24. The Board regret that so little reliable information has been furnished by the officers consulted: many of them have mistaken the drift of the inquiry. It has been *assumed* that where facilities exist, they must have been taken advantage of. It may, however, be said that the subject is one on which reliable information is not easily procured. The sale of illicit opium finds no place in any returns. It is always concealed. Both vendor and vendee are interested in its concealment. Of the correctness of the *conclusion*, that the use of the drug must increase where it can be purchased cheaply and close at hand, there can be no doubt. But to what extent the use of opium

has increased is a question which hardly admits of other than a conjectural reply. The Sanitary Commissioner, and the Inspector-General of Dispensaries, might, the Board consider, be consulted: they are perhaps in a better position than Commissioners and District Officers to watch the increased use of the drug, and to judge of its extent.

2.—*From* SECRETARY TO GOVERNMENT, *North-Western Provinces, to* SECRETARY TO THE BOARD OF REVENUE, *North-Western Provinces* (*No.* 272*A*).—*Dated Camp, Roorkee, the* 22*nd November*, 1872.

I AM directed to acknowledge the receipt of your letter No. 234, dated the 4th November, regarding the measures necessary for preventing the illicit sale of opium in opium-growing districts.

2. In reply, I am to thank the Board for their careful summary of the opinions of the officers consulted on the subject. The question, as to whether there is an increase in the use of opium, is one regarding which, in the absence of any statistics, variety of opinion was to be expected, and which, at the best, must rest on somewhat vague presumptions; and the Lieutenant-Governor did not therefore expect any precise conclusions on the subject.

3. There is a general consent (excepting on the part of the Collectors of Bustee, Benares, and Ghazeepore) that the cultivation of opium not only fosters on the part of the population, which thus has easier and cheaper access to the drug, a tendency to greater indulgence in its use than would otherwise be the case, but also tends to increase the number of persons who consume the drug; still to what extent there has been an increase in the number of opium-eaters and in the quantities consumed, and at what rate the increase is progressive, it is impossible to say. The only way in which such an increase could be tested would be to hold an enumeration of opium-

eaters to be compared at some future period with a similar enumeration—a measure which it would be very difficult to carry out, and which the occasion does not warrant. At the same time, it cannot be denied that the subject is one of the gravest importance, and deserves constant attention and close enquiry on the part of Government officers. With the object of keeping it in view, the Board's letter and this reply will be printed in the *Selections from the Records of Government.*

Art XXIII.

KATHA NUDDEE AND THE SWAMPS IN ITS VALLEY.

1.—*Report prepared by* CAPTAIN C. W. I. HARRISON, R.E., *Executive Engineer (on special duty), Eastern Jumna Canal, on the condition of the Katha Nuddee and the Swamps in its Valley; and of its capacity for acting as a thorough outlet for all the drainage and small swamps west of the Eastern Jumna Canal, between its 36th and 66th miles.*

REFERENCES:

No. 1987 I. of the Government, North-Western Provinces, Irrigation Branch, Public Works Department, dated 23rd November, 1870, with its enclosures, received under cover of No. 2927, dated 28th November, 1870, from the Superintending Engineer, 2nd Circle, Irrigation Works, North-Western Provinces.

REPORT:

The above Notification was issued with a view to giving effect to the proposals made by the Chief Engineer in his Note dated the 11th November, 1870, for carrying out the object contemplated by the conference held at Meerut on the 8th idem.

2. It will be seen from the opening paragraphs of the record of the proceedings of the Meerut Conference, that the enquiry which was to embrace the whole question of drainage was divided into three distinct heads:—

1*st*,—Over-irrigation and its prevention.

2*nd*,—Discovery and removal of impediments to free outflow of drainage.

3*rd*,—Examination of the main outfalls as to their capacity for their work, &c., and remedial measures regarding them.

My experience of the country within the canal bounds and immediately adjoining it, a very fair knowledge of the facts, and a short examination of the Nuddee, made it evident to me that one of the first things to be done, before any attempt was made to remedy matters under the second of the above heads, was to improve the main outfalls—the Katha and Kirsunnee Nuddees,—more especially the former, as, owing to their total incapacity to do their work, the lands adjoining them were water-logged, and the drainage, which should have found its way into them from a distance, was prevented from doing so —*firstly*, from deficiency of fall into the Nuddees themselves; *secondly*, from the evil effects in floods of the heading-back on the drainage cuts caused by the enduring floods in the Nuddees; *thirdly*, from inefficiency of the cuts; and *lastly*, from want of minor drains, with their necessary culverts, &c.

3. Accompanying this is a map of the level sheets, Nos. 1 and 2, showing that portion of them to which the present report refers.

4. Turning to the facts as shown by the cross-sections and an examination of the country, we find that the whole Hindun Jumna Doab for the extent of the Katha Nuddee is divided into three main drainage lines, with the commencement of another affluent of the Kirsunnee towards the south end. These three lines are the Kirsunnee on the east of the canal, the Shamlee or old canal line partly on one side, and partly on the other of the new line of canal, crossing it at several points, and the Katha on the west of the canal. In the first and last there is nothing to prevent the drainage of their respective catchment-basins being confined to their own channels; but the old canal, as has been mentioned, crosses the new line several times; and as no provision was made on the construction of that line above the Bhynswal under-drain, at the point where the

new line rejoins the old for passing the water from one side to the other, it would be impossible to do so now without going to heavy expense at every crossing. Owing to this fact, it has been found necessary in former years to take out a series of drainage cuts, right and left respectively, into the Kirsunnee, of which the Shamlee Nuddee is properly an affluent, and the Katha, with which it had formerly no connection. In order to employ these existing cuts profitably, I propose to look upon the Katha catchment-basin as consisting of the valley proper, and that portion of the Shamlee Nuddee which has been artificially added to it. A description of the course of the Nuddee through this valley, and of its more prominent features, will show clearly some of its great defects.

5. The Katha appears to have its source in the large depression of the Koomarherah Swamp in the Saharunpore District, which is fed chiefly by the drainage passing into it from the north and north-east. This swamp when filled to excess during the rains has two natural outlets, one towards the west passing through the south-eastern portion of the Berwee lands, and by a somewhat circuitous course reaching the culvert under the Pilkhunée Rajbuha to the north of the village of Jugehta Nujeeb. Thence the water finds its way through the lands of Doulat-Kheeree and Julalpore in a south-easterly direction, and being joined by the drainage from the direction of Jhuber-run, continues in the same general direction as far as Bholawala. It then turns southerly, and by a very tortuous drainage line, cultivated nearly throughout, finds its way past the villages of Pilkhunnah, Rundewuh, and Chapoorcheree, to a depression to the north of Umbehtah, where it forms a large tank. Its general course thence is west, south-west, until at length it falls into the Seyndlee Nuddee, near Merghun Muzruh, and forms one of its chief heads. This Nuddee is certainly one of the old channels of the Jumna, and marks the boundary of the khadir and bangur of that river, into which it eventually falls some 20 miles lower down in the Moozuffernuggur District.

6. The second outlet to the Koomarherah Swamp is in a southerly direction, by a somewhat marked line of lowlands past the village of Jugehta Goojur to opposite the junction of the Islamnuggur and Thurrowlee Rajbuhas. The line then turns westward, and, passing by a very tortuous route near the villages of Deednour and Suhejwee, comes under the Pilkhunnee Rajbuha by a culvert near the latter village. Thence passing Jajwuh and Thatkheree, between Jajwuh Chuchrowlee, and north of Mohee-ood-deenpoor, it turns south and again east, flowing to the north of Dhourala, and into a swampy depression south of Hurpal, where it is joined by another drainage line from the east and north-east, crossing under the Islamnuggur Rajbuha by a culvert. Up to this point the drainage line, except where it forms into ponds near villages, and at the Sahejwa Syphon is as a rule cultivated; very good rice crops being obtained when the rains are good, and in drier seasons wheat, barley, grain, and other rubbee crops being taken off it. From this point the drainage commences to have a marked channel, and obtains the name of the Katha. It is no longer cultivated in the actual channel, but wherever culturable, the land is ploughed up to within a few feet of the bank on either side; besides these two a third outlet—the "Dhalapri Drain"—has been dug, which takes the greater portion of its flood-waters directly off westwards to the Sirsawa Nuddee.

7. From Hurpal the Nuddee takes a south-westerly course, passing down by the villages of Kapourie and Huryalah, a little beyond the latter of which it turns southwards running through the lands of Manukpore and Mirzapore into Moradkheree. Along this distance there is cultivation as a rule close up to the Nuddee on either side, the ground being moist. From its entrance into the Moradkheree lands the cultivation is confined to the right bank, the left bank where not saturated with water being impregnated with "reh." Thence the stream passing close under Moradkheree on the north-east takes a south-easterly course, and being joined by two small depressions, one on

either side, enters a very large depression of upwards of 1½ square miles in extent lying between the villages of Kindul, Seetalpoor, Deednour, Khundun, Nagul, Seekheruh, and Buhlolpoor. Of the two depressions mentioned above, one runs up south of Moradkheree, and the other between Deedpoorah and Buhlolpoor. Even in the driest weather the central portions of these are swamps (choel), the remainder bearing rice if the rains are light; but in heavy rains the whole land becomes so saturated that none of it can be cultivated. The reach of the stream, between the point where it leaves these two depressions and enters the large swamp, has a somewhat high bank on its right close under which it runs, and a good deal of which is cultivated. On its left, on the contrary, the ground is very low and always flooded in the rains, and of the same character as the two small depressions just described, the water being close to the surface when not actually oozing through. The channel in this part is never dry, the water as a rule being almost level with the bank and perfectly stagnant, except when the surface is raised after rain. It is filled in most parts with a dense growth of reeds and bulrushes, which, in some places, extends over the adjoining lowlands also, and in such places the ground is never cultivated.

8. Soon after entering the large depression to which reference has been made in the last paragraph, the channel receives a considerable body of drainage water from the lands about Islamnuggur and to its north and north-east, which is passed under the Seekherah Rajbuha by means of a culvert opposite Buhlolpoor, and then divides into three branches.

The eastern-most of these—which is also the highest and has no marked channel at first—becomes connected with the main channel in heavy rains; at other times receiving only a local drainage of its own, and flows tortuously in a south-westerly direction between the villages of Nagul and Jhandkherah, and Khundwuh and Noorkheree. Here it passes down a distinctly marked channel in the ridge between the latter two

villages, and then spreads over the large depression between the villages of Deednour, Burgaon, and Khyrsal, and Jowansa-kherah. Of this I shall have to speak further on. The upper portion of this branch down to the villages of Noorkheree and Khundwuh bears good rice-crops except in heavy rains, when it becomes swamped by the Katha. It is, however, always more or less saturated with water.

9. The central and western-most branches are both distinctly marked—broad channels at first,—the former running south-westerly, however, soon loses its marked character under the village of Nagul, as if the Nuddee had tried to force away through the high ground between that village and Khundwuh and had failed. The third branch is traceable as a channel for a greater distance, but at length loses itself in a chain of ponds, re-appearing again about the centre of the swamp, and passing out from the south-west corner, opposite the village of Deednour. During the rains the whole of the lands for a considerable distance on either side of this last branch are inundated, as will be seen by the extent of the blue-tinted portion in the map. In dry seasons, however, the upper parts are comparatively free of moisture on the surface, though the water must be immediately below it, as the slightest rain turns them into a swamp, and even a continuance of easterly winds will sometimes have the same effect, particularly in the eastern portions or those nearest the canal. In both the central and western branches, and all the central portions of the depression, there is a dense growth of reeds and bulrushes, but the rest of it is covered either with dhak jungle, or a luxuriant crop of thatching-grass. There is scarcely a trace of cultivation, and what little land has ever been cultivated appears to be left fallow now.

10. After leaving the depression opposite Deednour, the Nuddee flows in a well-defined channel of very varying width, first south south-west, then south-west south past Raneekheree, and east south-east to Jowansakheree. Throughout this distance the channel runs very tortuously in a shallow depression,

covered with thatching-grass, and bordered by dhak and thorny bushes, more or less dense. There are a few cultivated fields here and there towards the lower portion, but very scattered. The whole depression is inundated in the rains, and the floods rise even into the adjoining borders of low bush-forest.

11. Just after passing Jowansakheree the Nuddee receives the Anutmow Cut, which brings into it the drainage from the low swampy lands adjoining the new and old lines of canals in the villages of Dhaka—Devee, Toomutkheree, and Anutmow, which again is received from a considerable area to the northwards, by means of drains and culverts under the Hungowlee Rajbuha. The Anutmow Drain also, to a certain extent, lets off the water from the depression between Burgaon and Khyrsal, mentioned in the 8th paragraph.

12. From the junction of the Anutmow Cut the Nuddee follows a course a little west of southpast the village of Sangutheruh, where it receives a shallow drainage line from the north-west. Rather more than a mile further on another small drainage line joins it from the Mehugee lands, and about the same distance on again, on reaching to a level with the village of Baloo, it is joined by the Tholuh Drainage Cut. To about three-fourths of a mile below Sangutheruh, there is cultivation on either side close up to the bank, and the channel for the most part is well-defined, and though very narrow, of an average depth of 4 feet or so. Just below Sangetheruh, however, the channel is confined by low dams to a space of some 5 or 6 feet wide, and cultivation is extended up to these. Beyond three-fourths of a mile below Sangutheruh a dense low dhak jungle borders both banks, in several instances to a considerable distance from the Nuddee. As in the last portion, the whole of this long reach consists of a narrow channel running with innumerable turns and twists down a shallow valley (here not so wide), over which, both cultivated and uncultivated, the water passes when the river is in flood. The land adjoining the chan-

nel is, however, comparatively dry and free from supersaturation, and apparently not affected injuriously by the floods.

13. The Tholuh Drainage Cut commencing in the swamp, which goes variously by the names of the "Hungowlee," the "Chuchrowlee," and the "Tholuh Jheel," and passing by the villages of Tholuh and Buhlolpoor, is intended to carry off the waters of the above jheel, and of the lowlands of Sulsuna and Burkheree direct into the Katha. It brings in a tolerably large body of drainage; but owing to want of fall, and insufficient depth of channel, cannot do its work properly. During floods, too, the water in it is, as in the Anutmow Cut, headed back for a considerable time.

14. From the junction of the Tholuh Cut the Nuddee bends somewhat near to the west, until passing Jharwun it takes a south south-easterly direction to Radour, and thence eastward for a short distance, when, after receiving a small quantity of drainage from the north, it turns to the south. It is here crossed by the only bridge on it that on the Gungoh and Teetron road, and shortly afterwards receives a drainage line coming down from the north-east. After flowing about half a mile further in the same direction it turns sharp to the west, until north of Phoonsgurh the Gundevara Drainage Cut falls into it. To within a little distance of Jharwun, the Nuddee runs through dhak jungle as before; the general valley being somewhat deeper, but still narrow, and the channel itself as winding as ever. Past Jharwun and down to Radour cultivation is carried on on either side, notwithstanding that the lands are liable to be flooded. They are free from supersaturation, though the water is always within four or five feet of the surface. Beyond Radour cultivation ceases, and the land shows signs of "kullur" and "reh," the valley becomes broader and somewhat shallower, and the flooded parts of the adjoining lands are in consequence more extensive.

Except for the narrowing at the bridge this continues down to the cut, cultivation is now here carried on, and, in addition

to "reh," there are marked signs of supersaturation in many places. The drainage line, which falls into the Nuddee below the Teetron Road Bridge, brings in all the drainage to the south of the Tholuh Cut, and appears to have been formerly one of the outlets for the drainage now carried off by that cut. Into this line also falls the Khanpore Escape from the Hungowlee Rajbuha.

15. The Gundevara Drainage Cut is another of these, to which reference is made in the 4th para. as having been constructed for the conveyance of the drainage from the lowlands near the old canal straight into the Katha Nuddee. The main cut commences in the Gundevara Jheel, lying between the old and new canals, into which the drainage is brought by means of the lowlands adjoining the former, runs somewhat north of west straight through the water-shed between the Katha and the old canal valleys, and crossing over two depressions in the east and west of the Hungowlee Rajbuha, falls into the Katha, just on the boundary between the Saharunpore and Moozuffernuggur Districts. A minor cut, made a few years ago to the west of the old canal into the Gundevara Cut, has improved considerably the drainage to the north.

16. From the junction of the Gundevara Drainage Cut the Nuddee runs for a short distance westward, and then turning again sharp to the south and passing down by the village of Mundait, trends a little to the west again, until, reaching the boundary of Gogour, Mundait, and Lowuh, it is joined by a drainage line which brings in the drainage from the east and north-east. It then flows south-west, north-west, and due west. Being joined by another small drainage line from the Lowuh lands, until on arriving in the lowland between Shamlee, Dhakooan, and Bussee, it receives a tolerably large affluent from the north-west. From the Gundevara Cut to Mundait the valley is occupied by a sparse dhak jungle, flooded in the rains, immediately outside of which the land is high but poor, and apparently but seldom cultivated. Below Mundait for about three-

fourths of a mile the valley widens out somewhat, and cultivation is carried on on both sides; rice and occasionally wheat being taken off the ground. After this the valley still continues wide, and is filled with a dense dhak jungle extending to some distance on either side. This is its character until nearly opposite Gogour; when the land on the left bank is cultivated. On the right the valley is low and swampy, and bounded by a broad belt of dhak forest. Beyond this up to Bussee the dhak forest occupies both sides; on the left, in a narrow belt outside of which there is cultivation, and on the right the belt is of a considerable width. The channel is, as usual, tortuous within the bounds of the valley, which itself is full of twists and turns.

17. From Bussee the Nuddee flows generally in a southerly direction past the villages of Bujheree, Hursanah, and Berah, and tending slightly to the west runs under Runganah, and almost immediately is crossed by the aqueduct for the Bidowlee Rajbuha. Near Bussee and Changearee the land is somewhat saturated, but is cultivated with rice, and close over stand the villages. On the right bank the swampy ground is bounded by dhak forest. The width of the valley is moderate, and this state of affairs continues down to near Bujheree. Thence the land is swampy and impregnated with reh to beyond Hursanah, and has a belt of dhak jungle on either side. Below this point the valley widens again, the stream running under its left bank, on which is a narrow belt of dhak jungle, with cultivated land outside of it; again to the right the valley is filled with a dense growth of dhak, which extends on to the adjoining high land. There is no swamp. This continues to somewhat below Berah; the valley then narrows again, but is still entirely covered with dhak, which, on the right bank, extends to a width of a mile or more. Just above Ranganah the dhak ceases, and the valley is cultivated on both banks of the stream up to the Bidowlee Rajbuha.

18. For about a mile below the Bidowlee Rajbuha, the stream still flows south; it then turns somewhat suddenly to

east south-east, and running for nearly a mile in that direction again bends to somewhat west of south, and receiving the drainage from the Bhynswal Cut turns west, with a circuitous course back again into its former line. From the Bidowlee Rajbuha to the reach above the Bhynswal Cut the valley is confined and filled with a dense dhak growth, which extends over the high ground on either side of it. The valley then almost disappears, the channel of the Nuddee being of some width, and floods seldom passing over its bank to any extent, the land is quite open; that on the right, however, only being cultivated.

19. The Bhynswal Cut is the fourth and last one on this side of the canal for diverting the drainage of the Shamlee Nuddee to the Katha. It branches off from the low ground on the right of the canal where the new canal rejoins the old, and is intended to aid the Shamlee Nuddee in carrying off the drainage brought down alongside of the old canal, picking up on its way the drainage of the lowlands to the north of the town of Bhynswal. It appears to have been quite inadequate to do its share of the work, as about the year 1862-63 another cut was taken off in communication with the same point, to convey the drainage past the town of Sulawur to the Kirsunnee Nuddee. The drainage about here has much improved of late years, but it never can be satisfactory until the bed of the Bhynswal Drain can be lowered.

20. Beyond the Bhynswal Cut the Nuddee takes as has been said, a circuitous course round to the south; on the right bank it is low, and becomes completely flooded in the rains. It is all uncultivated, being somewhat impregnated with "reh." On the left the land is rather higher, becoming only partially inundated. Rice is grown on the lower parts of it, and rubbee crops nearer the town of Jhinjanah; just opposite the latter the road from Meerut to Kurnal crosses the Nuddee, and below this down to Tarapore the channel is tolerably wide, with a low strip on either side of it in which rice is cultivated. Outside these strips the land is high but poor, and there is scarcely any cultivation.

21. From Tarapore the Nuddee runs almost due west to near Paotee Khoord, when it takes a circuitous course round that village; and after being joined by a drainage line from the north-west, runs for a short distance to the south-east, and then has a steady course to the south down to a mile beyond the village of Jindheree. It then trends a little to the west of south, is joined by a drainage line from the north-west about half a mile above Gundraon, and, running under that village and Mahomedpoor, at length falls into the Jumna river near the village of Nugla Raee. From Tarapore to Paotee Khoord the valley is about, on an average, a quarter of a mile wide, and the channel follows a most tortuous course down it. There is much dhak jungle, and no cultivation whatever. From this point the Nuddee alters its character. It has hitherto, except at one or two points, and then only for short distances, consisted of a shallow channel running in a comparatively shallow valley. It now deepens considerably, and the valley, instead of consisting of a single step, has banks of various heights, and shows all the signs of a river gradually deepening its bed and altering its course during the operation. Until arriving near Beebeepore, the valley is as usual covered with dhak jungle, but above and below that village the east bank is cultivated, and there is a strip of cultivation on the right bank, outside of which is a belt of dhak, and then a high, poor, and uncultivated stretch of country. Beyond again, as far as Jhindheree there is dhak, and the ground on either bank is wholly uncultivated. From Jhindheree onwards the springs in the bed are perennial even in the driest weather, and the rest of the tail portion of the Nuddee is never dry. There are a few bits of cultivation near Jhindheree, but beyond, nearly as far as Gundraon, there is a very heavy growth of dhak, and the land is quite unmarked. From this point to the tail of the Katha there is cultivation on either side right up to the edge of the banks which are here very high, and from 100 to 300 feet apart only. The course is as trotuous as ever, if not more so, and the banks being high, the stream, even in flood is forced to follow all the

windings. To add to the difficulty which the water thus has in passing off rapidly, the floods in the Jumna cause a very considerable heading-back, insomuch that the people about state that when that river is in flood the Katha is headed back, or, at any rate, has its stream retarded as far up as Paotee Khoord.

22. From the above description it will be seen that the Nuddee is divisible into several distinct portions, with well-marked differences in their character, but with one feature common to all.

I.—From the Koomarherah Jheel to the 14th mile (*vide* sheets Nos. 1 and 2, and longitudinal section sheet No. 3) there is a mere drainage line having no defined channel, cultivated throughout with the exception of some few portions, and always more or less moist, though not actually swampy.

II.—From the 14th mile to the 19th mile a defined channel, in a somewhat shallow valley, cultivated with rice and other crops right up to the channel soil, always moist, more especially in the upper portion where it is close to the Islamnuggur Rajbuha and its irrigation, but still not a decided swamp.

III.—From the 19th mile to the 25th mile a true swamp, with no cultivation within its bounds, and but very little round it; its area covered, in the deeper portions, with a heavy growth of reeds and bulrushes, and in the shallower with a thick crop of thatching grass.

IV.—From the 25th mile to the 65th mile the general character is as in No. II.,—a shallow channel in a comparatively shallow but very variable valley, more or less swampy in parts generally where the water from drainage cuts or drainage lines is thrown into it; the less moist land being cultura-

ble, cultivated in parts up to the banks of the channel, though liable to be covered with floods in the rains. In other parts filled with a dense growth of dhak jungle, which in places extends to a considerable distance on either side, the soil in other parts again being impregnated with "reh."

V.—From the 65th mile to the tail a much more marked channel, a narrower and deeper valley, or rather valley within a valley, the higher portions of which are never inundated, a perennial stream from springs, and during the rains a stream liable to be affected to an injurious extent by floods in the Jumna.

23. Lastly, the feature which is general to all parts is, that not only is the immediate valley of the Katha most tortuous, but the true channel within it turns and twists to a very remarkable degree, so that, although the distance from the head in the Koomarherah Jheel to its junction with the Jumna at Nugla Raee is in a straight line (and it will be seen from the map that on the whole the Katha runs in a wonderfully straight course) only 41 miles, yet the chain lines of the survey reach a total of 75 miles, and from an enlarged plot of a portion of it. I estimate that rather more than one-eighth, or say 10 miles, must be added to this, making a total of 85 miles for the length of the channel proper. I must not be misunderstood in the meaning of the word valley in the above description. I have applied it merely to the marked depression, with tolerably strong slopes on either side within which the floods are carried. From this the ground rises with more or less abruptness, and in some cases to a considerable distance. The whole is, of course, the real "valley" of the river, but I have in this instance attached a special meaning to the word.

24. I have only referred to the Nuddee proper, but I may mention in addition, as points to be particularly noticed, the swampy land to the south of Deednour and the Chuchroulee

Jheel; the former, which is in fact a branch of the Katha, being flooded by it in heavy rains, and returning its water to that stream; and the latter is so intimately connected with it, that nothing but a very great improvement in the Nuddee can afford relief to the swamp.

25. Now it is evident from the above details that, exclusive of any defects in drainage which may exist outside the immediate valley of the Katha, there are portions of its own channel and the adjoining lands so saturated with water, that whatever the cause, and whether we examine the subject from a sanitary or fiscal point of view, there is very little doubt of the necessity for a remedy, and the advisability of its application within the bounds of practicability.

26. In order to obtain as correct a knowledge as possible of the nature of such remedy or remedies, I propose to examine the more important defects and their apparent causes so far as I have been able to gather information on the subject; and as some of these are noticed as possible causes in the instructions laid down by the Chief Engineer, it would be as well to take them in the order there given. They are—

(1) Obstacles to drainage.

A.—Bridges with insufficient waterway.

B.—Banks or dams.

C.—Crops or vegetation obstructing the flow.

(2) Over-irrigation.

(3) Passage of canal-water into drainage lines from escapes.

(4) Silting up.

In addition we may add—

(5) Sufficiency or otherwise of fall in channel.

(6) Damming back from surplusage of drainage without any adequate arrangements for improving the outfall.

(7) Damming back at the tail of the outfall itself.

27. *Obstacles to Drainage, Bridges.*—There are only four masonry works on the Katha Nuddee :—

I.—The Suhejwee Syphon, I am inclined to think, does cause some obstruction, though not much judged by the present bed of the Nuddee, and it more properly belongs to the general drainage of the country.

II.—The remains of a bridge on the Islamnuggur and Umbehta road has no effect, the water passes on either side of it at all times, and a new bridge is, I believe, proposed to be built by the Civil authorities.

III.— A large bridge of 3 spans of 24 feet each on the Teetron and Gungoh road; it causes no obstruction to the water as matters now are, but I fear, that to do any good in the Katha, it will be necessary to rebuild it.

IV.—*The Bidowli Rajbuha Aqueduct.*—There appears to be some doubt as to whether this does or does not cause obstruction. The bed of the Nuddee, a little distance below it, falls a foot or two somewhat suddenly, though at the site of the aqueduct there is scarcely any appearance of cutting out in the channel opened out at the time of its being constructed. Any little fault, however, as regards this, could under present circumstances be easily remedied by excavating a channel through the second bay of the aqueduct, only one having ever been dug to the full depth of the nuddee bed; the excavated portion being as wide, if not wider, than the channel of the Nuddee. The aqueduct consists of two bays of forty feet each clear. There is the same difficulty, however, here as regards the foundation not being deep enough to allow of any lowering of the bed.

28. *Banks* or *Dams.*— I have given in Appendix A. (not printed) a list of the dams found along the course of the Nuddee in April and May, 1871, to which I have added two or three, seen in the present month. They do not, as a rule, appear to do any harm by altering the levels of the bed. In one or two instances there has been erosion and a corresponding deposit further down, but it is to a very limited extent. I think this is explicable from the fact that during floods the high bunds give way, whilst the low ones, being no higher than the bank on either side, scarcely affect the stream at all. Silt, too, is not deposited, simply because there is so little of it. The stream is a very sluggish one even in flood; and, at other times, when there is any water at all, it runs clear and comparatively free from mud. The dams, however, no doubt cause considerable damage by holding up the water in the soil instead of allowing it to pass freely off, and thus the soil in their vicinity, and for some distance above them, remains saturated with water much longer than it would under ordinary circumstances.

29. *Cultivation of Crops.*—From the description of the character of the nuddee, it will have been seen that for the greater portion of its course land immediately adjoining the channel, and which is always inundated in the rains, is either cultivated or covered with a more or less dense growth of dhak jungle reeds or grass.

It is only in a few places that the land is clear. Down to Hurpalee the whole width of the drainage line is cultivated more or less, but below that point there is always a marked channel, very narrow in certain places it is true, as at Sangutherah; but still a channel which should be clear. Even in this, however, aquatic plants have grown luxuriantly in most places. The result of this is that, what with the tortuousness of its course, and this growth of weeds, the water always flows sluggishly. When confined to the channel, with a depth of over two feet in a channel 20 feet wide; and when the water was flowing after rain almost level with the banks of the channel, the surface

velocity was only 1 foot a second. In the rains, again, when the water overflows the banks of its low channel, it floods land covered with vegetation, and this retards the free flow enormously. Thus, at all seasons, whether in flood or merely carrying off the moisture infiltrated into the soil, the stream is sluggish, and removes the water far too slowly to keep the spring level in the upper parts of the drainage area to a proper level.

30. *Over-irrigation.*—That this takes place I think there is very little doubt, and I hope in another report to be able to point out the localities where I find it chiefly exists.

31. *Passage of Canal-water into Drainage-lines from Escapes.*—There are six escapes from which water is passed into the Katha Nuddee,—all of them on rajbuhas.

I.—The Hurpal Escape—Is just above the point where the drainage-line from the north-east passes under Islamnuggur Rajbuha, and joins the Katha below Hurpal. The water from it falls into the Katha almost direct, the nuddee being only a few hundred yards away.

II.—The Islamnuggur Escape—Is on the Seekheruh Rajbuha, a short distance above the Islamnuggur Culvert, and throws its water into the drainage line from the latter, which passes between the villages of Buhlalpoor and Bumbeealah joining the Katha below the latter village.

III.—The Hungowlee Escape—Is on the Rajbuha of that name at the point where it crosses the Anutmow Drainage Cut. It throws its water into the latter which runs thence some 3½ miles westward into the Katha.

IV.—The Teekroul Escape—Is on the same Rajbuha just above the Teekroul Bridge, and forms as it were the head of the Tholuh Drainage Cut, which

running thence through the lowlands east and south of Buhlolpoor, is carried westward past the villages of Tholuh and Kaloo to the Katha, a total distance of some four miles off.

V.—*The Khanpoor Escape*—Is on the same Rajbuha, nearly a mile above the town of Teetron. A cut runs from it to a drainage line coming from the north and passing close by the village of Khanpoor, whence it runs in a south-westerly direction and crossing under the Teetron and Gungoh road falls into the Katha, a short distance below. This drainage line is extremely tortuous.

VI.—*The Jhinjhanah Escape*—Is on the Khyranah Rajbuha, at the point where it crosses the Bhynswal Drain and throws its water into it. The drain thence continues its westward course for above two miles into the Katha which it joins close to the town of Jhinjhanah.

32. I have been unable to obtain any satisfactory information regarding the extent of water thrown into the Katha from these escapes, nor would it be possible to do so, as no record is kept of the times when they are opened, or the number of days they remain open. It would appear, however, that they are only used when absolutely necessary, and as none of them are at any great distance from the heads of the rajbuhas, they could not remain open more than a few hours. As matters are, however, none of the first five can be opened for one hour without causing injury, although that injury may be very slight; for No. I., before the water can be passed off, floods, to an extent corresponding with the time it remains open the low moist lands below Hurpal; No. II. throws its water on the already saturated soil of the Seekheruh Swamp; No. III., before it can find its way into the Katha, will, if opened in the rains, most probably aid in increasing the Deednour Swamp owing to the Anutmow Cut being always breached near Peer Majra during

the wet season. In the cold weather it would probably cause less injury, as it would have to go some distance down the Katha before it reached over-saturated soil; No. IV. throws its water into the Chuchrowlee Swamp—the Tholuh Cut being unable to carry off the water as fast as it escapes from the rajbuha; and No. V. injures the low moist lands below Khanpoor; No. VI. alone can be apparently opened without much injury.

33. *Silting-up.*—Of this I have been unable to find any worth noting that could be traced to any particular cause. There are slight siltings at a few of the bunds, and also one near the tail of the Anutmow Cut; but excepting the last, they are quite insufficient to materially affect the stream—even the one just mentioned does not hold up the water more than a few inches. An examination, however, of the longitudinal section sheet No. 3 shows that, whatever be the cause, the bed is irregular and the slope in it very variable. Not only are there distinct and abrupt elevations, but in some cases the bed seems to rise generally for a considerable distance—as for instance, miles 14, 23, 30 to 32 and 61. It would appear more as if the bed had cut out unevenly whilst in course of formation, and that the variableness is wholly due to natural causes, such as different degrees of stiffness in soil, growth of weeds, &c. At any rate, I consider that we cannot look to any artificial cause as an explanation.

34. *Insufficiency of Fall in the Channel.*—This, in combination with the obstruction offered by grass, crops, and undergrowth, must be assigned as one of the chief causes for the inability of the Nuddee to do its work properly. In Appendix B. I have given a table of the fall of the bed per mile in different parts of the Nuddee, and the average falls throughout as obtained from the section sheet No. 3, and I have added a short memo. of the peculiar circumstances of each. On examining the section, it appears that whilst the fall of the Nuddee throughout is 1·51 feet per mile, there are no less than 49 miles out of the whole length of 90, in which the fall is below the average—26 miles having an average slope, and only 15 a

higher one. Taking these in detail, again there is insufficient slope in the first 15 miles, but this is, to a certain extent, corrected by the good fall in the next 7½. The effect of this, however, is only to make matters worse in the 3rd section, where in Seekheruh Swamp there is only 6 inches fall in 8½ miles—a defect enormously increased by the great natural obstructions as reeds, grass, &c., due themselves no doubt to the want of velocity. In the 4th section the fall improves, tending to draw off the water from the jheel, but this is shortly counteracted by the small fall in the next section—a fault due very possibly to some evil effect produced from the Anutmow Cut, and to the obstructions at and below Sangutherah. The next section of 21½ miles is fair, though the fall is still insufficient when the obstructions are considered. A great deal of drainage is poured into this section in the rains, and even in the dry season there is always some water being passed into it from the Chuchrowlee Jheel through the Tholuh Cut. This water, however, soon disappears, the bunds and want of fall causing it to sink into the soil, swamping the adjoining lands to a certain extent. The next section is defective again, and no doubt the bunds in this section, aided by deposits brought by the two drainage lines from Lowuh and Dutheruh, are to blame to a certain extent. Individually they may not affect the bed in their neighbourhood, but they do so as a whole. There are generally some pieces of swampy ground in it, and the velocity in floods must be greatly reduced by the dhak jungle. The 8th section has an average fall, but evidently insufficient, as water lies towards its commencement, the moisture being due probably to the water brought down by the Poor Drainage and the Bhynswal Cut. The good fall in the next section aids in keeping the lower portion of the previous one dry. The last section has an insufficient fall, due no doubt to the effects of the Jumna floods upon the stream of the Katha, there being a deposit of silt at the junction extending a little way up the channel.

35. *Damming back from Surplusage of Drainage.*—Not one of the four large cuts, which are tailed into the Nuddee, is

free from this defect, but the Anutmow and the Tholuh are the ones that suffer most. In the case of the former, either the heading back caused by the Katha flood, or else the pressure of water from the Deednour swamp, in which the water brought from the Katha, as explained in para. 8, being held back by the bank of the cut, causes this bank to give way, whereupon the drainage water in the cut is emptied into the swamp, and even Katha water comes up into it along the drain. The result is that the swamp has much more water thrown into it than it would receive naturally. Formerly the Anutmow Cut only existed as far as the Chuchrowlee Jheel, into which it emptied itself near Hungowlee. The swamp, however, was so much increased by this, that it was deemed advisable to prolong the cut on to the Katha. Since this was done, it has had an equally ill effect in the Deednour lowlands, without benefiting the Chuchrowlee Jheel to anything like a corresponding extent. Before this took place, the lowlands of Deednour, Burgaon, Khyrsal, and Peer Majra, used to produce very fine crops of rice, and now there are something like 800 to 900 acres of this rice-land which have been almost permanently thrown out of cultivation. Very occasionally, if the year should happen to be an extremely dry one, a portion of this can be cultivated, but, as a rule, if cultivated the crop is destroyed. The Tholuh Cut, excepting opposite and about the town of Kaloo, passes through lowlands, and when the stream is headed back by the Katha it floods them, and ceases for the time-being to act as an outlet.

36. *Damming back at the tail of the outfall.*—The floods in the Jumna affect, and to a serious extent, those in the Katha. The water is retarded at times as far back almost as Potee Khoord, and occasionally when the former was in flood, and the latter not, the stream came back for some miles. This heading-back not only retards the outflow directly and at the moment, but as a consequence a bar of silt is deposited at the tail, which later on prevents the stream from flowing freely, and causes the water to be retained for a longer period in the subsoil.

37.—To summarise. The defects appear to be—

(1) A.—Possibly the Bidowlee Aqueduct, though without any very clear cause.

B.—Nearly a score of bunds, which though individually causing no alteration in the bed, hold the water in the sub-soil, and collectively prevent the bed from keeping an even slope.

C.—Cultivation of crops in the first 15 miles, and a growth of grass reeds and dwarf forest affecting the flow of the stream in floods in the greater part of its length.

(2) *Over-irrigation*—On this a separate report will be submitted.

(3) *Canal Escapes*—Certainly assist in increasing the swamps.

(4) *Silting*—Doubtful. If there is any, it is due to the natural obstructions more than to artificial ones.

(5) *Insufficiency of Falls*—One of the chief defects.

(6) *Damming back of Drainage*—Affects the cuts leading into the Nuddee.

(7) *Back-water of the Jumna*—Seriously retards the outflow in the rainy season, and, by silting up the tail, prevents the water from passing off freely at other times.

38. *Remedial measures considered.*—Possibility of diverting the Nuddee. On examination of the capabilities of the Seyndlee Nuddee, and the results of two or three sections to the Jumna, it was evident that very little was to be expected in that direction. I give one of the sections which is most favourable as regards excavation, and as favourable as any other on other points, in sheet No. 9, from which it will be seen that, although the bed of the Jumna is sufficiently low to allow of a fall of 17·22 feet in a distance of 10 miles, or 1·7 per mile from the present bed of the Nuddee, yet that the fall to the

level of surface-water in the dry season is only 1·4 per mile, and in floods the surface water of the Jumna rises to within 6 feet of the bed. It was found still more impracticable on account of cost to divert the Nuddee eastwards.

39. In Appendix F. I have given the calculations of flood-discharge of the river that I consider the most reliable, although I fear their value as a guide is very small. It will be seen that No. 4, in the abstract at the end, gives a far lower discharge than any up to 30 miles above it, and its peculiarity is that it is the most favourable as regards permitting the even flow of the flood, there being no dhak or grass jungle to check it. I think there can be no doubt that to this retarding power of the dense undergrowth must we look for an explanation of the high results obtained elsewhere; at the same time, it must be remembered that this checking of the stream has a beneficial effect as regards extent of the flooding over the lands in the lower portion of the Nuddee. The floods rise less and last longer.

40. Section No. 4 gives a discharge of about 15 cubic feet per second per square mile, whilst those above give results varying from 28·5 to 52 cubic feet per second. The last discharge obtained from sections below Paotee Khoord, near Jhindheree, gives about 19 cubic feet per second. There is a good deal of jungle in this locality also, and I confess that, what with that and the possibility of obstruction from the Jumna, I should have looked for a much larger discharge; for it is not so great as the one 15 miles further up, although some rather large drainage lines join in the interval.

41. The tables of rain-fall appended to this report show, 1*st*, the heaviest rain-falls registered and gauged on any one day, the area over which it extended, and the average rain-fall in that area; 2*nd*, the number of days of continual heavy rain, the fall per day during that period, and the average fall over extended areas for the same period; 3*rd*, the number of days without rain after a heavy fall. In order to estimate the fall

over a sufficiently extended area for the Kirsunnee and Katha Nuddees, I have included the whole of the gauges in the Saharunpore and Moozuffernuggur districts, thus taking the whole belt between the Ganges and Jumna rivers. *Secondly*, to obtain rather more local results, I have thrown out the Roorkee and Khutowlee Gauges, and thus confined the fall to the Jumna, Hindun, Doab, and a little east of it, and lastly to procure data specially for the Katha Valley. I have further thrown out the Deobund, Moozuffernuggur, and Boorhanah gauges. These three areas are the 1st and 2nd and 3rd circles respectively in the following tables and abstracts.

As it is probable that no harm is done by allowing water to lie for two or three days, I have further directed attention to the largest average fall in a period of four consecutive days, with a view to discovering what might be the largest quantity of rainfall to be disposed of in 4 days, either as a heavy fall in one day, or lighter falls over an extended period.

42. The following extract from Extract No. 212 of Mr. Wynne's Settlement Report, dated 17th May, 1867, shows the yearly loss of revenue to Government by the swamps in the Katha Valley :—

"In 17 villages marginally noted, the revenue demand might be greatly increased if the Katha Nuddee were drained. As there has long been talk of such a project,

Pergunnah.	Village.	Amount of jumma. Cost by Government by the continuance of the swamp.		
Nukoor	Buhlolpoor, ...	176	...	...
Ditto,	Bunneealah, ...	105	...	...
Ditto,	Seekhera, ...	40	...	...
Ditto,	Sherpoor, ...	244	...	...
Gungah	Janid Kherah, ...	138	...	...
Ditto,	Deednour, ...	266	...	...
Ditto,	Jowansa Khera, ...	114	...	...
Ditto,	Khyrsal, ...	253	...	...
Ditto,	Rajpoor, ...	272	...	...
Ditto,	Bohut Kheree, ...	232	...	...
Ditto,	Behlolpoor, ...	243	...	...
Ditto,	Hydurpoor, ...	356	...	...
Ditto,	Sutsura, ...	412	...	...
Ditto,	Beerkheree Mosalman,	356	...	...
Rampore	Shahjehanpore, ...	140	...	...
Ditto,	Undaolee, ...	72	...	...
Ditto,	Chuchrowlee, ...	546	...	...
	Total, ...	3,965	...	...

I have inserted in the engagements of these villages a clause to the effect, that if the Katha is straightened so as to "act "as a proper drain for the marsh, they shall be held, subject to "revision of settlement.

"I have entered in the margin the amount by which, in my "opinion, if the land were thoroughly drained, the Govern- "ment demand might be increased. At the same time I must "express my apprehension that by no process short of very "considerably *deepening* the bed of the Katha, could the swamp "be so drained that the villages would bear the full amount "of the increased jumma. I think Mr. Wynne refers in his es- "timate to the lands actually included within the area of the "jheels. If I am right in this opinion, there is the question "of whether the draining of the Katha will not benefit all the "land along its banks which at present lies uncultivated, and "discovered with nothing but dhak jungle. If so, the benefit "be greatly increased, and also the lowlands along the course "of the old canal, and other lowlands, not included in this "estimate, would benefit by any improvement to the Katha "Nuddee."

43. In conclusion, I cannot do better, I think, than quote the conviction expressed by Mr. Wynne, that by no process short of very considerably *deepening* the bed of the Katha could the swamp be so drained that the villages would bear "the full amount of the increased jumma." What he says regarding the revenue applies with equal force to the sanitary condition. I had long ago come to the same conclusion, without being in the least aware of this opinion, and I take this opportunity of recording it.

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Eastern Jumna Canal.

APPENDIX B.

Table showing fall of Bed in different portions of the Katha Nuddee—vide *Longitudinal Section No 3.*

	Station.	Distances from Koomarheah Jheel.		Reduced level of bed.	Distance from previous point.	Fall from previous point.	Fall per mille.	Remarks.
		By measurment on map.	With one-eighth added.					
	1.	2.	3.	4.	5.	6.	7.	
1	Koomarherah Jheel,...	...	...	885·86	...	...	...	The scale of the map being only four inches to the mile, it is impossible to show clearly all the turns and twists of the Nuddee. It appears, however, from a portion of it plotted to a large scale that about one-eighth at least should be added to obtain the distances approximately, hence the addition in the 3rd column. It is on these distances that the fall is calculated. In the last three lines are given the average fall throughout the nuddee; *first*, from the Koomarherah Jheel to the junction with the Jumna; and *second* from Hurpal, whence it is intended to commence operations to the same point; and *lastly*, for the distance embraced by this project—*viz.*, from Hurpal to Paotee Khoord, where the Head of the Tail-cut is proposed.
2	Hurpal, ...	13·000	14·625	870·50	14·625	15·36	1·05	
3	163—21st mile, ...	19·629	22·083	844·61	7·458	25·89	3·47	
4	193—24th „ ...	22·659	25·491	844·10	3·408	0·51	0·15	
5	223—28th „ ...	26·337	29·629	835·06	4·138	4·09	2·18	
6	258—32nd „ ...	30·973	34·845	829·88	5·216	5·18	0·99	
7	392—48th „ ...	50·216	56·493	797·08	21·648	32·80	1·52	
8	465½—58th „ ...	60·064	67·572	783·91	11·079	13·17	1·19	
9	492—61st „ ...	64·373	72·419	776·72	4·847	7·19	1·48	
10	512—64th „ ...	67·16	75·562	769·04	3·143	7·68	2·44	
11	596—74th „ ...	79·903	89·891	750·25	14·329	18·79	1·31	
	Average from Koomarheah Jheel to Tail,	79·903	89·891	...	...	135·61	1·51	
	Ditto from Hurpal to Tail, ...	66·903	75·266	...	...	120·25	1·60	
	Ditto from Hurpal to Paotee Khoord, ...	56·866	63·974	764·70	...	105·80	1·65	

From 1 to 2.—There is no channel, the velocity being evidently insufficient to cause one, and even what would be due to so small a fall is further checked by the cultivation of crops.

„ 2 to 3.—Water runs off. There is no dhak jungle, and only in floods do crops somewhat retard the stream.

„ 3 to 4.—Seekherah Jheel. In this portion reeds and bulrushes in channel; growth of grass over hole lowland.

„ 4 to 5.—Recommencement of channel leaving jheel; grass in lowland and dhak outside; water passes down from jheel, but dries up.

„ 5 to 6.—Anutmow Drainage Cut comes in a little beyond the centre of this portion. Sangutheruh diminished channel and ghat at its head, and a little way beyond a very sharp turn in the river two or three bunds.

„ 6 to 7.—Nine bunds, Tholuh Cut at 36th mile, Teetron Bridge and Khanpore Escape at 41st, Gundevara Drain 43rd mile:—a good deal of dhak jungle; some small swamps.

„ 7 to 8.—Ten bunds, Lawuh and Dutheruh drainage join Bidowlee Rajbuha Aqueduct; at end dhak jungle.

„ 8 to 9.—Poor Drainage and Bhynswal Cut come in, dhak at commencement, and sometimes a little water.

„ 9 to 10.—Alawadeenpoor drainage comes in; no dhak; all dry.

„ 10 to 11.—Boodhanah, Beebeepore, and khurreef drainage fall in; much dhak jungle; spring-water towards lower portions.

APPENDIX E.

Rain-fall and Irrigation Statistics.

Rain-fall being the natural source of supply for the subsoil water, we will take it first. The following table has been abstracted from the weekly returns published in the *Government Gazettes*. I fear we start therefore with erroneous data, for there is great doubt as to the correctness of these returns in former years, whatever may be their character now-a-days. The statement gives the average fall during the khurreef and rubbee, respectively—*i.e.*, from 1st April to 30th September, and from 1st October to 31st March, for the past 10 years, at various points in the Saharunpore and Moozuffernuggur Districts :—

Station.	Khurreef.	Rubbee.	Total for year.
1. Saharunpore, ... 1 2 3 circle.	33·53	5·69	39·22
2. Nukoor, ... 1 2 3 „	29·14	5·41	34·55
3. Deobund, ... 1 2 0 „	27·21	4·47	31·68
4. Roorkee, ... 1 0 0 „	37·64	4·74.	42·38
5. Shamlee, ... 1 2 3 „	23·45	3·55	27·00
6. Moozuffernuggur, ... 1 2 0 „	26·60	4·20	30·80
7. Boorhanah, ... 1 2 0 „	25·98	4·43	30·41
8. Khutowlee or Jansuth, 0 1 0 „	27·86	5·35	33·21
Total from 1st Circle, ...	231·41	37·84	269·25
Average for „	28·926	4·73	33·656
Total for 2nd Circle, ...	165·91	27·75	193·66
Average for „	27·652	4·625	32·277
Total for 3rd Circle, ...	86·12	14·65	100·77
Average for „	28·707	4·883	33·59

The circles above mentioned are the same as those described in para. 14. The gauges here detailed are somewhat far apart unfortunately; still they are the only ones available, and, considering their arrangement, the comparatively level character of the ground, the absence of any cause likely to affect the rain-fall within its area, and, as regards its proximity at one end to the Sewalik Hills, that the gauges are fairly distributed along its length, I think we may take the average as

a very fair one. Circle 3 corresponding with the Katha Valley, and its averages being somewhat higher than that of the 2nd Circle, I have taken it for the following calculations. Those averages are 28·707 inches for the khurreef and 4·883 inches for the rubbee.

Next as regards the water poured into the irrigated land by the canal. Taking the Revenue Reports for the Eastern Jumna Canal from the years 1865-66 to 1870-71, both inclusive, we find as follows :—

Khurreef.—Average discharge 1,104 cubic feet per second.

Ditto duty per cubic feet per second 84·56 acres.

Ditto number of days canal was closed 16.

Rubbee.—Average discharge 872 cubic feet per second.

Ditto duty per cubic feet per second 149·47 acres.

Ditto number of days canal was closed 26.

From which data we have $\frac{1 \times 60 \times 60 \times 24 \times 167}{84{\cdot}56 \times 43{\cdot}560} = 3{\cdot}9172$ feet, = 47·01 inches as the average depth of water poured on to the irrigated land during the khurreef.

And $\frac{1 \times 60 \times 60 \times 24 \times 156}{149{\cdot}47 \times 43{\cdot}560} = 2{\cdot}0701$ feet = 24·84 inches as the average depth for the rubbee. These are the averages for the whole canal. In the case of the khurreef, however, I think the amount must be considered too low for the portion of country with which we have to deal chiefly on account of the preponderance of rice-irrigation.

On the irrigated lands, therefore, we have 47 + 28·707 : 75·707 inches as the total depth of water poured on them in the khurreef, and 24·84 + 4·883 = 29·723 inches as the rubbee depth, whilst on the unirrigated, the amounts are 28·707 and 4·883 inches respectively.

It is thus evident that if sufficient allowance be made for passing off the quantity of water supplied to the channel by springs and percolation alone during the khurreef, there will be ample allowance for the rubbee, as even supposing that the evaporation in the former were twice or three times as great as in the latter, the supply in the former would still not fall below that of the latter.

APPENDIX F.

Flood discharges of the Katha Nuddee.—The difficultly of obtaining anything like correct data with the winding channel which the Katha has, and the dense growth of grass and dwarf forest through which the floods find their way, makes it almost a hopeless task to arrive at trustworthy flood-discharges. However, I give such as appear to be most reliable—*vide* Sheets Nos. 3 and 11.

Cross-section No. 24, Station 2·54, 32nd mile, Area = 1,486. Wetted perimeter = 936. Hydraulic mean depth = $\frac{1486}{936}$ = 1·587.

Cross-section 25, Station 269, 34th mile.

Area = 1,030 square feet, wetted perimeter = 500 hydraulic mean depth = $\frac{1030}{500}$ = 2·06.

H. M. D. of Section No. 24 = 1·587 area = 1,486
H. M. D. of Section No. 25 = 2·060 area = 1·030
2 / 3·647 2 / 2·516

∴ Mean H. M. D. = $\frac{A}{P}$ = 1·8235 ∴ mean area $\frac{A}{1}$ = 1·258.

Distance between the sections along the flood-line = 9·800 and fall in that distance = 837·50 − 829·60 = 7·9 feet.

$$\therefore S = \frac{9{\cdot}800}{7{\cdot}9} = 1{\cdot}241$$

$$V = 90 \sqrt{\frac{A}{P} \over S} = 3{\cdot}447$$

D = AV = 4336 cubic feet per second.

Drainage area about 83 square miles.

Discharge per square mile $= \frac{4336}{83} = 52$ cubic feet per second.

Cross-section No. 33, station 374, 46th mile. area = 1440·15. Wetted perimeter = 1323·3. ∴ hydraulic mean depth = $\frac{1,440·15}{1,323·3}$ = 1·0883.

Cross-section No. 34, station 384, 48th mile. area = 2552·63. Wetted perimeter = 1604·36. ∴ hydraulic mean depth = $\frac{2,552·63}{1,604·36}$ = 1·5911.

H. M. D. of Section No. 33 = 1·0853. Area = 1440·15

" " No. 34 = 1·5911 " = 2552·63

2 / 2·6794 2 / 3992·78

∴ Mean H. M. D. = $\frac{A}{P}$ = 1·3397 mean A = 1996·39

Distance between = 6·200 feet and fall in that distance = 808·74 805·44 = 3·30.

$$\therefore S = \frac{6200}{3·30} = 1878·8$$

$$V = 90\sqrt{\frac{A.}{P.}} = 2·4033$$

$$D = A.\ V = 4·797·9$$

Drainage area about 150 square miles.

∴ Discharge per square mile = $\frac{4797}{150}$ = 32 cubic feet per second.

Cross-section No. 38, station 432, 53rd mile. Area 3557·48. Wetted perimeter = 1532·93. ∴ hydraulic mean depth. = $\frac{3557·48}{1532·93}$ = 23207.

Cross-section on line 30 near Bujheree, 54th mile. Area = 1065·91. Wetted perimeter = 1401·14. ∴ hydraulic mean depth = $\frac{1065·91}{1401·14}$ = 7,607.

Cross-section No. 40, station 454, 56th mile. Area = 2,456·54. Wetted perimeter = 1499·9. ∴ hydraulic mean depth = $\frac{2456·54}{1499·9}$ = 1·6378.

All three of these sections appeared to be obtained on trustworthy information, but the central one, although taken close to a village, seems to be wrong as regards the water-surface,

and gives such curious results that I have taken out the discharges; firstly, with all three sections; secondly, with the 1st and 2nd; thirdly, with the 1st and 3rd; and fourthly with the 2nd and 3rd.

First—H. M. D. Section 38 = 2·3207 Area = 3557·48
„ Line 30 = ·7607 „ = 1065·91
„ Section 40 = 1·6278 „ = 2456·54
$3\overline{)4{\cdot}7192}$ $3\overline{)7079{\cdot}93}$

Mean H. M D. $= \frac{A.}{P.} = 1{\cdot}5731$ Mean Area $= A = 2359{\cdot}98$.

Distance between extreme sections = 1·4750, and fall in that distance = 796·54 − 790·78 = 5·76.

$$\therefore S = \frac{14750}{5{\cdot}76} = 256{\cdot}8$$

$$V = 90 \sqrt{\frac{\frac{A.}{P.}}{S.}} = 2 : 3600$$

$$D = A.\ V. = 5264{\cdot}3$$

Drainage area about 185 square miles.

∴ Discharge per square mile $= \frac{5264{\cdot}3}{185} = 28{\cdot}5$ cubic feet per second.

Second—H. M. D. Section 38 = 2·3207 Area = 3557·48
„ Line 30 = ·7607 = 1065·91
$2\overline{)3{\cdot}0814}$ $2\overline{)4623{\cdot}39}$

Mean H. M. D. $= \frac{A2}{P2} = \overline{1{\cdot}5407}$ Mean $\overline{\text{Area}} = \frac{A}{2} = \overline{2{,}311{\cdot}695}$

Distance between sections = 3,000 feet, and fall in that distance = 796·54 − 794·98 = 1·56.

$$\therefore S = \frac{3000}{156} = 1923{\cdot}1$$

$$V_2 = 90 \sqrt{\frac{\frac{A2}{P2}}{S}} = 2{\cdot}5474$$

$$D^2 = A_2\ V_2 = 5891{\cdot}4$$

Drainage area as before 185 square miles.

Discharge per square mile $= \frac{5891{\cdot}4}{185} = 31{\cdot}8$ cubic feet per second.

Third,—H. M. D. Section 38 = 2·3,207 Area = 2,557·48

„ 40 = 1·6,378 = 2,456·54

2 / 3·9,585 2 / 6,014·02

Mean H. M. D. $= \frac{A_3}{P_3} = 1·9,792$ Mean area $\frac{A}{3} = \times 3,007·01$

Distance between section = 14,750 feet, and fall in that distance = 796·54 − 790·78 = 5·76.

$$\therefore S = \frac{14750}{5·75} = 2,560·8.$$

$$V_3 = 90 \sqrt{\frac{A_3}{P_3}} = 2,502·1.$$

$$S.$$

$$D_3 = A_3 V^3 = 7,523·8.$$

Drainage area as before = 185 square miles.

∴ Discharge per square mile $= \frac{7523·8}{185} =$ 40·7 cubic feet per second.

Fourth,—H. M. D. Section line 30 = ·7607 Area = 1065·91.

„ „ 40 = 1·6378 = 2456·54

2 / 2·3985 2 / 3522·45

Mean H. M. D. $= \frac{A_4}{} = 1·1992$ Mean area $= A_4 = 1761·22$.

Distance between section = 11,750 feet, and fall in this distance = 794·98 − 790·78 = 4·20.

$$\therefore S = \frac{11750}{4·20} = 2797·6$$

$$V = \sqrt{\frac{A}{P_4}} = 1·863·0$$

$$S$$

$$D_4 = A_4 V_4 = 3281·2$$

Drainage area as before = 185 square miles.

∴ Discharge per square mile $= \frac{3281·2}{185} =$ 17·7 cubic feet per second.

Discharge by second = 5891·4 cubic feet per second.

„ third = 7523·8 „ „

„ fourth = 3281·2 „ „

3 / 16696·4

Mean discharge = 5565·5 „ „

Giving a discharge of $\frac{5565 \cdot 5}{185} = 30 \cdot 1$ cubic feet per second per mile, which agrees very fairly with the first.

Cross-section No. 44, station 491, 61st mile. Area = 1973·76. Wetted perimeter = 1729·16. ∴ hydraulic mean depth = $\frac{1973 \cdot 76}{1729 \cdot 16} = 1 \cdot 1414$.

Cross-section on line 34, 63rd mile. Area = 1974·22, wetted perimeter = 1104·41.

∴ hydraulic mean depth = $\frac{1974 \cdot 22}{1104 \cdot 41} = 1 \cdot 7876$.

H. M. D. Section 44 = 1·1414 Area = 1973·76

„ Line 34 = 1·7876 „ = 1974·22

2 / 2·9290 2 / 3947·98

∴ Mean H. M. D. = $\frac{A.}{P.} = 1 \cdot 4645$ Mean area = A = 1973·99.

Distance between section = 6250 feet, and fall in that distance = 782·30 − 780·37 = 1·73 feet.

$$\therefore S = \frac{6250}{1 \cdot 73} = 3612 \cdot 7,$$

$$\therefore V = 90 \sqrt{\frac{\frac{A.}{P.}}{S.}} = 1 \cdot 8121.$$

D = A. V. = 3577 cubic feet per second.

The fall in the bed is 1·93 which would give S = $\frac{6250}{1 \cdot 93} = 3238 \cdot 3$ using this we have—

$$V = 90 \sqrt{\frac{\frac{A.}{P.}}{S.}} = 1 \cdot 9319.$$

D = A. V. = 3778·1.

The drainage area is about 245 square miles.

∴ Discharge per square mile = $\frac{3577}{245} = 14 \cdot 2$ cubic feet per second by the former, and by the latter.

Discharge per square mile = $\frac{3778 \cdot 1}{245} = 15 \cdot 4$ cubic feet per second.

Cross-section No. 49, Station 547, 68th mile. Area = 1971·42, wetted perimeter = 1092·71. ∴ hydraulic mean depth = $\frac{1971 \cdot 42}{1092 \cdot 71} = 1 \cdot 8042$.

Cross-section No. 50, Station 558½, 70th mile. Area = 1941·87, wetted perimeter = 1107·07. ∴ hydraulic mean depth = $\frac{1941·87}{1107·07}$ 1·7541.

H. M. D. Section	49	=	1·8042	Area	=1971·42
„ „	50	=	1·7541	„	=1941·87
		2	3·5583		2 | 3913·29

∴ Mean H. M. D. $\frac{A.}{P.}$ = 1·7791 ∴ Mean area = A = 1956·64

Distance between the section = 6,250 feet, and fall in this distance = 771·59 − 768·73 = 2·84.

$$\therefore S = \frac{6250}{2·84} = 2200·7.$$

$$V = 90 \sqrt{\frac{\frac{A.}{P.}}{S.}} \doteqdot 2559.$$

$$D = A. V. = 5006·95.$$

Drainage area is about 260 square miles.

∴ Discharge per square mile = $\frac{5006·95}{260}$ = 19·25 cubic feet per second.

The following shows the above results in a tabulated form:—

Mile.	Discharge cubic feet per second.	Drainage area by miles.	Discharge per squar mile cubic feet per second.	Remarks.
1. 32nd to 34th, ...	4336	83	52	Upper third no jungle, remaining two-thirds heavy dhak jungle.
2. 46th to 48th, ...	4797·9	150	32	Upper half open, lower half full of jungle.
3. 53rd to 56th,	5264·3	185	28·5	Three Sections— 1st and 2nd; 1st and 3rd; 2nd and 3rd; Average of last three, — Upper half moderate dhak jungle, lower half densely covered.
	5891·4	185	31·8	
	7523·8	185	40·7	
	3281·2	185	17·7	
	5565·5	185	30·1	
4. 61st to 63rd,...	3577·0	245	14·2	Open.
	3778·1	245	15·4	
5. 68th to 70th,...	5006·9	260	19·25	Dhak jungle.

N.B.—Mileage measured along Katha, not line of Captain Harrison's Project.

C. A

APPENDIX I.

Drainage Areas of the Katha Nuddee at various points.

Station on Longitudinal Section Sheet No. 4.	Area of each Section.	Total Areas to Tail of each Section.
	Sq. Miles.	Sq. Miles.
0· Head near Hurpal,... ...	37·75	37·75
48· For Seekheruh Jheel Cut, ...	19·25	57·00
79· Junction of Anutmow Drainage Cut,	26·00	83·00
105· Junction of Tholuh Drain, ...	31·75	114·75
137· Junction of Gundevara Drain, ...	33·00	147·75
186· Near Hursawah, ...	37·50	185·25
222· Junction of Bhynswal Drain, ...	59·75	245·00
246· Head of Supplementary Tail Cut near Paotee Khoord, ...	10·25	255·25
Tail Junction with Jumna, ...	22·75	278·00

In calculating the drainage area, its boundaries have been taken as follows :—On the west the watershed as approximately as it could be ascertained. On the east the canal as mentioned in the report; on the north the line of the Dhalapra Drain. It would be as well to mention here that the latter is, with its present dimensions, quite incapable of doing its work, and that it is absolutely necessary that it should be enlarged, and so made capable, as one if its objects was to cut off entirely the heads of the Katha drainage. In this project they are supposed to be thus cut off.

Tabular Statement of Heavy Rain-falls in the Saharunpore and inclusive, abstracted from the North-Western

No.	Years.	Dates.	Length of period.	Locality.	Total fall during period.	Aver	
						1st Circle.	2nd
						During rainy days.	During four days.	During rainy days.
					Inches	Inches.	Inches.	Inches.
I.	1863	16th, 17th and 18th June.	3.	Saharunpore, ...	10·3	3·43	2·575	3 43
				Nakoor, ...	5·7	1·90	1·425	1·90
				Deobund, ...	7·6	2·53	1·900	2·53
				Shamlee, ...	1·5	0·50	0·375	0·50
				Roorkee, ...	8·4	2·80	2·100	...
				Moozuffernuggur, ...	0·3	0·10	0·075	0·10
				Boorhanah, ...	4·6	1·53	1·150	1·53
				Jansuth or Khatowlee,	4·0	1·33	1·000	...
				Totals, ...	...	14·13	10·600	10·00
				Averages, ...	...	1·76	1·325	1·66
II.	„	9th, 10th 11th, and 12th July.	4.	Saharunpore, ...	4·1	1·025	...	1·025
				Nakoor, ...	6·6	1·650	...	1·650
				Deobund, ...	1·6	0 400	...	0·400
				Shamlee, ...	4·4	1·100	...	1·100
				Roorkee, ...	0·7	0·175	...	0 700
				Moozuffernuggur, ...	2·8	0·700	...	0·650
				Boorhanah, ...	2·6	0·650	...	...
				Jansuth or Khatowlee,	2·2	0·550	...	...
				Totals, ...	...	6·250	...	5·525
				Averages, ...	...	0·781	...	0·921
III.	„	25th and 26th July.	2.	Saharunpore, ...	...	...	...	...
				Nakoor, ...	...	...	...	...
				Deobund, ...	1·3	0·65	0·325	0·65
				Shamlee, ...	3·9	1·95	0·975	1·95
				Roorkee, ...	1·2	0·60	0·300	...
				Moozuffernuggur, ...	3·1	1·55	0·775	1·55
				Boorhanah, ...	5·0	2·50	1·250	2·50
				Jansuth or Khatowlee,	4·1	2·05	1·025	...
				Totals, ...	...	9·30	4·650	6·65
				Averages, ...	...	1·163	0·581	1·108

Moozuffernuggur Districts during the years 1863-1871, *both Provinces Government Gazette, &c.*

AGES.			Remarks.	AVERAGE.		
Circle.	*3rd Circle.*					
During four days.	During rainy days.	During four days.		1st Circle.	2nd Circle	3rd Circle.
Inches.	Inches.	Inches.				
2·575	3·43	2·575	Total time to dispose of this fall 8 days.			
1·425	1·90	1·425				
1·900	...	...				
0·375	0·50	0·275	On 16th June: 5·4″ fell at Saharunpore. 4·5″ at Nakoor. 5·1″ at Deobund. 4·6″ at Boorhanah. 4·0″ at Jansuth.			
...	...	...				
0·075	...	...		3·55	3·57	3·8
1·150	...	...				
...	...	...				
7·500	5·83	4·375	5·3 registered at Roorkee on 18th, ...	1·1	0·58	1·07
1·250	1·94	1·4583				
...	1·025	...	Introduced with slight rain on the 8th, average 0·26, and excepting a fall of 1·1″ at Deobund, 7 days available for its disposal.			
...	1·650	...				
...	...	...				
...	1·100	...				
...	...	...				
...	...	...				
...	...	...				
...	...	...				
...	3·775	...				
...	1·2383	...				
...	...	...				
...	...	...	5 days available for disposal; 4·1″ fell at Khatowlee on 25th.			
0 325	...	...				
0·975	1·95	0·975				
...	...	...				
0·775	...	...	...	1·52	1·13	6·43
1·250	...	...				
...	...	...				
3·325	1·95	0·975				
0·554	0·65	0·325				

Tabular Statement of Heavy Rain-falls in the Saharunpore and inclusive, abstracted from the North-Western

No.	Year.	Dates.	Length of period.	Locality.	Total fall during period.	Aver	
						1st Circle.	2nd
						During rainy days.	During four days.	During rainy days.
					Ins	Inches.	Inches.	Inches.
IV.	1863	30th, 31st July, and 1st, 2nd August.	4.	Saharunpore, ...	7·20	1·800	...	1·800
				Nakoor, ...	3·80	0·950	...	0·950
				Deobund, ...	5·1	1·275	...	1·275
				Shamlee, ...	11·4	2·850	...	2·850
				Roorkee, ...	8·0	2·000	...	...
				Moozuffernuggur, ...	11·1	2·775	...	2·775
				Boorhanah, ...	8·0	2·000	...	2·000
				Jansanth or Khatowlee,	8·9	2·225	...	...
				Totals, ...	...	15·875	...	11·650
				Averages, ...	...	1·9844	...	1·9417
V.	„	7th August.	1.	Saharunpore, ...	...	...	...	...
				Nakoor, ...	...	...	...	...
				Deobund, ...	...	...	...	...
				Shamlee, ...	...	...	...	...
				Roorkee, ...	...	...	...	...
				Moozuffernuggur, ...	...	...	...	...
				Boorhanah, ...	...	...	...	...
				Jansuth or Khatowlee,	...	...	...	...
				Totals, ...	...	...	...	...
				Averages, ...	...	...	...	...
VI.	„	28th October.	1.	Saharunpore, ...	...	...	...	...
				Nakoor, ...	...	...	...	...
				Deobund, ...	...	...	...	...
				Shamlee, ...	...	...	...	...
				Roorkee, ...	...	...	...	...
				Moozuffernuggur, ...	...	...	...	...
				Boorhanah, ...	...	...	...	...
				Jansuth or Khatowlee,	...	...	...	...
				Totals, ...	...	...	...	...
				Averages, ...	...	...	...	...

Moozuffernuggur Districts during the years 1863-1871, *both Provinces Government Gazette, &c.*—(continued).

AGES.				AVERAGES.		
Circle.	*3rd Circle.*					
During four days.	During rainy days.	During four days.	Remarks.	1st Circle.	2nd Circle.	3rd Circle
Inches.	Inches.	Inches.				
...	1·800	...	On 30th July { 7·0″ fell at Moozuffernuggur, 5·8″ fell at Jansuth,	1·8	1·17	...
...	0·950	...				
...	...	...				
...	2·850	...	On 31st July { 6·4″ fell at Saharunpore, 4·6″ at Shamlee, 4·4″ at Boorhanah,	2·62	3·25	3·27
...	...	...				
...	...	...				
...	...	...				
			8 days available for disposal.			
...	5·600	...				
...	1·8667	...				
...	...	...	...	1·6125	1·12″	2·03″
...	...	...				
...	...	...				
...	...	...				
...	...	...				
...	...	...				
...	...	...				
...	...	...				
...	...	...	On the 7th August 5·7 fell at Saharunpore and 6·1 at Roorkee, confined chiefly to upper part of district. 3 days available for disposal.			
...	...	...				
...	...	...				
...	...	...				
...	...	...				
...	...	...				
...	...	...				
...	...	...				
...	...	...	On 28th October, ...	1·675	2·05	2·5
...	...	...				
...	...	...				
...	...	...	No rain afterwards.			
...	...	...				
...	...	...				
...	...	...				
...	...	...				
...	...	...				

Tabular Statement of Heavy Rain-fall in the Saharunpore and inclusive, abstracted from the North-Western

No.	Year.	Date.	Length of period.	Locality.	Total fall during period.	Aver	
						1st Circle.	2nd
						During rainy days.	During four days.	During rainy days.
					Ins.	Inches.	Inches.	Inches.
VII.	1864	1st, 2nd, 3rd, 4th, and 5th August.	5.	Saharunpore, ...	9·3	1·86	2·175	1·86
				Nakoor, ...	12·6	2·52	3·050	2·52
				Deobund, ...	9·2	1·84	1·975	1·84
				Shamlee, ...	3·4	0·68	0 850	0·68
				Roorkee, ...	10·4	2·08	2·000	...
				Moozuffernuggur, ...	5·6	1·12	0·675	1·12
				Boorhanah, ...	3·3	0·66	0·675	0·66
				Khatowlee, ...	7·2	1·44	1·175	...
				Total, ...	...	12·20	12·575	8·68
				Average, ...	...	1·525	1·572	1·447
VIII.	"	1st, 2nd, and 3rd September.	3.	Saharunpore, ...	3·9	1·267	0·950	1·267
				Nakoor, ...	1·2	0·400	0 300	0·400
				Deobund, ...	3·5	1·167	0·875	1·169
				Shamlee, ...	1·0	0·333	0·250	0·332
				Roorkee, ...	5·5	1·833	1·375	...
				Moozuffernuggur, ...	1·4	0·467	0·350	0·467
				Boorhanah, ...	5·6	1·867	1·400	1·867
				Khatowlee, ...	2 4	0·809	0·600	...
				Total, ...	...	8·133	6·100	5·499
				Average, ...	...	1·017	0·763	0·916
IX.	1867.	21st and 22nd July.	2.	Saharunpore, ...	7·6	3·80	1 900	3·80
				Nakoor, ...	7·1	3·55	1·775	3·55
				Deobund, ...	6·3	3·15	1·575	3·15
				Shamlee, ...	12 3	6·15	3·075	6·15
				Roorkee, ...	4·1	2 05	1·025	...
				Moozuffernuggur, ...	6·3	3·15	1·575	3·15
				Boorhanah, ...	5·7	2·85	1·425	2·85
				Khatowlee, ...	3·2	1·60	0·800	...
				Total, ...	...	26·30	13·150	22·65
				Average, ...	...	3·29	1·644	3·775

Moozuffernuggur Districts during the years 1863-71, *both Provinces Government Gazette, &c.*—(continued.)

AGES.				AVERAGES.		
Circle.	*3rd Circle.*		Remarks.	1st Circle.	2nd Circle.	3rd Circle.
During four days.	During rainy days.	During four days.				
Inches.	Inches.	Inches.				
2·175	1·86	2·175				
3·050	2·52	3·050	The four days selected are the first four when the rain was heaviest.	1·613	1·767	3·0
1·975	...	...				
0·850	0 68	0·850				
...	...	...	On the 1st 5·7″ fell at Nakoor.			
0 675	...	...				
0·675	...	...	On 4th August 4·2″ fell at Saharunpore. 4·7″ at Deobund. 5·0″ at Roorkee.	3·1	2·9	3·01
...	...	...				
9·400	5·06	6·075	No further rain worth mentioning up to 28th of the month.			
1·567	1·687	2·025	On 28th 4·3″ fell at Saharunpore, almost confined to that point.			
0·950	1·267	0·950				
0·300	0·400	0·300				
0·875	...	...				
0·250	0·333	0 250	This fall was preceded by			
...	...	...	average falls on the 30th			
0·350	...	...	and 31st July of ...	0 637	0·85	0·67
1·400	...	...	And, ...	0·675	0·40	0·07
...	...	...	And there was no rain to speak of after it.			
4·125	2·000	1·500	On 1st 4·0″ fell at Roorkee, ...	1·09	1·6	1·37
0·688	0·667	0·500				
1·900	3·80	1·900	On 21st highest fall at Moozuffernuggur 5·3″ ...	1·90	2 00	1·33
1·775	3·55	1·775				
1·575	...	...	On 22nd 11·3 was registered			
3 075	6·15	3·075	at Shamlee, ...	4·67	5·55	7·67
...	...	...	The Canal Gauge at Bhynswal,			
1·575	...	...	about 5 miles off, registered			
1·425	...	...	only 5·0 on this same date.			
...	...	...	4·0 were registered at Barote.			
			4·4 ditto at Sirdhana.			
			4·6 ditto at Meerut.			
11·325	13·51	6·750	With the exception of a somewhat local fall of 4·30 at			
1·887	4·50	2·050	Saharunpoe on 26th, there were 9 days available for disposal.			

Tabular Statement of Heavy Rain-fall in the Saharunpore and
inclusive, abstracted from the North-Western

No	Year.	Date.	Length of period.	Locality.	Total fall during period.	Aver	
					1st Circle.		2nd
					During rainy days.	During four days.	During rainy days.
					Ins.	Inches.	Inches.	Inches.
X.	1867	2nd, 3rd, 4th, 5th, and 6th August.	5.	Saharunpore, ...	9·7	1·94	1·975	1·94
				Nakoor, ...	6·8	1·36	1·600	1·36
				Deobund, ...	6 9	1·38	1·275	1·38
				Shamlee, ...	4·5	0·90	1·125	0·90
				Roorkee, ...	6·7	1·34	1·425	...
				Moozuffernuggur, ...	6·6	1·32	1·575	1·32
				Boorhanah, ...	4·0	0·80	0·825	0·80
				Khatowlee, ...	7·1	1·42	1 400	...
				Total, ...	...	10·46	11·2	7·70
				Average, ...	...	1·307	1·4	1 253
XI.		26th, 27th, and 28th June.	3.	Saharunpore, ...	2·4	0·8	0·600	0·80
				Nakoor, ...	5·7	1·9	1·425	1·90
				Deobund, ...	2·7	0·9	0 675	0·90
				Shamlee, ...	16·0	5·33	4·000	5 33
				Roorkee, ...	1·4	0·47	0·350	...
				Moozuffernuggur, ...	10·7	3·57	2 675	3·57
				Boorhanah, ...	9·2	3·07	2 300	3 07
				Khatowlee, ...	4·9	1·63	1·225	...
				Total, ...	...	17 67	13·25	15·57
				Average, ...	...	2·21	1 66	2·59
	1870	17th July,	1.	Saharunpore, ...	...	...	...	...
				Nakoor, ...	...	...	...	...
				Deobund, ...	...	...	...	...
				Shamlee, ...	...	...	...	...
				Roorkee, ...	...	...	...	...
				Moozuffernuggur, ...	...	...	...	...
				Boorhanah, ...	...	...	...	...
				Khatowlee, ...	...	...	...	...
XII.	1871	11th and 26th June.	1.	Saharunpore, ...	...	...	...	...
				Nakoor, ...	...	...	...	...
				Deobund, ...	...	...	...	...
				Shamlee, ...	...	...	...	...
				Roorkee, ...	...	...	...	...
				Moozuffernuggur, ...	...	...	...	...
				Boorhanah, ...	...	...	...	...
				Khatowlee, ...	...	...	...	...
				Total, ...	...	...	...	...
				Average, ...	...	...	...	...

Moozuffernuggur Districts during the years 1863-1871, *both Provinces Government Gazette, &c.*—(continued.)

AGES.			Remarks.	AVERAGES.		
Circle.	*3rd Circle.*					
During four days.	During rainy days.	During four days.		1st Circle.	2nd Circle.	3rd Circle.
Inches.	Inches.	Inches.	Adding—5″ fell at Bhynswal,	4·71	5·47	7·0
1·975	1·94	1·975	Substituting Bhynswal Gauge			
1·600	1·36	1·600	for Shamlee Gauge, ...	3·89	4·50	5·57
1·275	...	...	On 4th 5·2″ fell at Saharunpore,	1·86	2·13	3·3
1·125	0·90	1·126	On 4th 4·8″ fell at Moozuffer-			
...	...	...	nuggur, ...	1·20	1·53	0·63
1·575	...	...	No rain worth mentioning			
0·825	...	...	after the 28th, ...			
...	...	...	The 4 days selected are the			
			last four when the rain			
8·375	4·20	4·701	was heaviest.			
			On 27th 9·5″ fall at Shamlee,			
1·396	1·40	1·567	5·9 „ at Moozuf-	2·975	3·57	3·63
			fernuggur.			
0·600	0 800	0·600	On 27th 4·6″ fell at Boorhana.			
1·425	1·900	1·425	5·5″ at Bhynswal;			
0 675	...	...	6·6″ at Meerut.			
4·000	5·33	4·000	5·2″ at Baghput.			
...	...	...	4·7″ at Sirdhana.			
2 675	...	...	So that it was confined			
2·300	...	...	chiefly to the south of the			
...	...	...	Saharunpore District.			
...	...	...	Time available for disposal 8			
			days.			
...	...	...	Adding—Bhynswal, ...	3·767	3·843	2·85
...	...	...	Substituting Bhynswal Gauge			
...	...	...	for Shamlee Gauge, ...	2·475	2·486	2·30
...	...	...	On 17th July 6·4″ registered			
...	...	...	at Saharunpore; very local;			
...	...	...	as the average for all the			
...	...	...	other gauges together was			
...	...	...	only $\frac{34}{17}$=0·49.			
...	...	...				
...	...	...	On 11th June 4·8; fall at			
...	...	...	Saharunpore very local; the			
...	...	...	other gauges registering—			
...	...	...	Nakoor, 0 3.			
...	...	...	Khatowlee, 2·4.			
...	...	...	On 26th June 4·2″ fell at			
...	...	...	Saharunpore, ...	1·65	1·38	2·13
...	...	...	No fall worth taking account			
			after this till 10th July, so			
...	...	...	that 14 days available.			
...	...	...				

Tabular Statement of Heavy Rain-fall in the Saharunpore and inclusive, abstracted from the North-Western

No.	Year	Date.	Length of period.	Locality.	Total fall during period.	Aver	
						1st Circle.	2nd
						During rainy days.	During four days.	During rainy days.
					Ics.	Inches.	Inches.	Inches.
XIII.	1871	8th, 9th, 10th, 11th, and 12th August.	5.	Saharunpoor, ...	10·2	2 04	2·525	2·04
				Nakoor, ...	4·9	0·98	1·225	0·98
				Deobund, ...	6·7	1·34	1·600	1·34
				Shamlee, ...	7·4	1·48	1·275	1·48
				Roorkee, ...	4 2	0·84	1·025	...
				Moozuffernuggur, ...	5·7	1·14	1·375	1·14
				Burhanah, ...	9 5	1·90	1·775	1·90
				Khatowlee, ...	12·5	2·50	1·975	...
				Total, ...	...	12·22	12·775	8·89
				Average, ...	...	1·527	1·597	1·48

Moozuffernuggur Districts during the years 1863-1871, *both Provinces Government Gazette, &c.*—(concluded.)

AGES.				*Averages.*		
Circle.	*3rd Circle.*		Remarks.	1st Circle.	2nd Circle.	3rd Circle.
During four days.	During rainy days.	During four days.				
Inches,	Inches.	Inches				
2·525	2·04	2·525				
1·225	0·78	1·225	On 9th 4·8 fell at Saharunpore, 4·9 at Deobund, ... 4·5 at Khatowlee, ...	2·6	2·55	2·4
1·600	...	...	On 17th 4·6 at ditto ...	1·25	0·88	0 80
1 275	1·48	1·275				
...	...	...				
1·375	...	...				
1·775	...	...				
...	...	...				
9·775	4:50	5·025				
1·629	1·50	1·675				

ABSTRACT No. 1.

Heaviest recorded rain-falls in the 24 hours from 1862 to 1871, both inclusive.
Fall of 4·0″ and upwards have been considered as heavy.

Number.	Date.	Locality.	Fall in inches.	Average. 1st Circle.	Average. 2nd Circle.	Average. 3rd Circle.	
1	1863. 16th June.	Saharunpore, ...	5·4	3·55	3·57	3·80	First of 3 days of rain—*vide* I., Abstract No. 2.
		Nakoor, ...	4·5				
		Deobund, ...	5·1				
		Boorhanâh, ...	4·6				
		Jansuth, ...	4·0				
2	18th June.	Roorkee, ...	5·2	1·10	0·58	1·07	Solitary.
3	25th July.	Khatowlee, Jansuth,	4·1	1·52	1·13	0·43	First of 2 days of rain—*vide* III. in Abstract No. 2.
4	30th July.	Moozuffernuggur,	7·0	1·80	1·17	...	First of 4 days of rain—*vide* IV. in Abstract No. II. None in the 3rd Circle on this date.
		Khatowlee or Jansuth, ...	5·8				
5	31st July.	Saharunpore, ...	6·4	2·62	3·25	3·27	Same fall as last second of 4 days—*vide* IV. Abstract No 2.
		Shamlee, ...	4·6				
		Boorhanah, ...	4·4				
6	7th August.	Saharunpore,	5·7	1·612	1·13	2·03	Solitary.
		Roorkee,	6·1				
7	1864. 1st August.	Nakoor, ...	5·7	1·613	1·767	3·00	First of 5 days of rain—*vide* VII., Abstract No. 2.

8	4th August.	Saharunpore, ... Deobund, ... Roorkee, ...	4·2 4·7 5·0	3·10	2·90	3·07	Same rain as last; fourth of five days of rain—*vide* VII., Abstract No. 2.
9	28th August.	Saharunpore, ...	4·3	Confined to that locality.			
10	1st September.	Roorkee, ...	4·0	1·89	1·60	1·37	First of 3 days of rain—*vide* VII., Abstract No. 2.
11	1867. 21st July.	Moozuffernuggur,	5·30	1·90	2·00	1·33	5·60″ registered on the Kalsea* Rain-gauge.
12†	22nd July.	Saharunpore, ... Nakoor, ... Deobund, ... Shamlee, ... Boorhanah, ...	5·60 6·10 4·00 11·30 5·30	... ... 4·67 4·71 3·59	... ... 5·55 5·47 4·50	... ... 7·67 7·00 5·57	Canal gauge at Bhynswal, 5 miles from Shamlee, registered only 5·0. The blue-ink entries show the average if this be added, and the red if it be substituted for Shamlee.
13	1867. 4th August.	Saharunpore, ...	5·3	1·86	2·13	3·30	Third of 5 days of rain—*vide* X., Abstract No. 2
14	5th August.	Moozuffernuggur,	4·8	1·20	1·53	0·63	Same fall as above; fourth of 5 days, of rain—*vide* X., Abstract No. 2.
15	1870. 27th June.	Shamlee, ... Moozuffernuggur, Boorhanah, ...	9·5 5·9 4·6	2·975 3·767 2·475	3·57 3·843 2·486	3·63 2·85 2·30	Canal rain-gauge at Bhynswal registered only 5·5. Blue entries includes this, and red entries show average when Bhynswal gauge is substituted for Shamlee. Second of 3 days of rain—*vide* XI., Abstract No. 2.

* First of 2 days of rain—*vide* IX., Abstract No. 2.
† Same rain as last second of 2 days of rain—*vide* IX., Abstract No. 2.

ABSTRACT No. 1—(*concluded.*)

Number.	Date.	Locality.	Fall in Inches.	Average.			
				1st Circle.	2nd Circle.	3rd Circle.	
16	17th July.	Saharunpore, ...	6·4	Very local; average for all the other gauges together only 0·49″.			
17	1871. 11th June.	Saharunpore, ...	4·8	Very local.			
18	26th June.	Saharunpore, ...	4·2	1·65	1·38	2·13	Solitary.
19	9th August.	Saharunpore, ...	4·8	...	...	...	Second of 5 days' rain—*vide* XIV., Abstract No. 2.
		Deobund, ...	4·9	2·60	2·55	2·40	
		Khatowlee or Jansuth, ...	4·5	...	...	...	
20*	12th August.	Khatowlee, or Jansuth, ...	4·6	1·25	0·88	0·80	Same fall as above; fourth of 5 days of rain—*vide* XIV., Abstract No. 2.

* Next for the largest fall over an extended area in ten or more consecutive days, and the largest fall in four days.

ABSTRACT No. 2.

Number.	Date.	Period of Days.	Averages.						Number of days available for disposal.
			1st Circle		2nd Circle.		3rd Circle.		
			During days of rain.	During four days.	During days of rain.	During four days.	During days of rain.	During four days.	
	1863.								
I.	16th. 17th, and 18th June, ...	3	1·76	1·325	1·66	1·250	1·94	1·458	8
II.	9th, 10th, 11th, and 12th July, ...	4	0·781	...	0·921	...	1·258	...	7
III.	25th and 26th July, ...	2	1·163	0·581	1·108	0·554	0·65	0·325	5
IV.	30th and 31st July, 1st and 2nd August, ...	4	1·9844	...	1·947	...	1·8667	...	8
V.	7th August, ...	1	...	...	...	...	...	...	3
VI.	25th October, ...	1	...	...	...	...	...	...	
	1864.								
VII.	1st, 2nd, 3rd, 4th, and 5th August,	5	1·525	1·572	1·447	1·567	1·687	2·025	No further rain worth noting up to 28th of August.
VIII.	1st, 2nd, and 3rd September, ...	3	1·017	0·763	0·916	0·688	0·677	0·50	No rain to speak of after this.
	1867.								
IX.	21st and 22nd July, ...	2	3·29	0·644	3·775	1·887	4·50	2·25	9
X.	2nd, 3rd, 4th, 5th, and 6th August,	5	1·307	1·40	1·283	1·396	1·40	1·567	No rain worth mentioning up to 28th.
	1870.								
XI.	26th, 27th, and 28th June, ...	3	2·21	1·66	2·59	1·946	2·68	2·008	8
	1871.								
XIII.	11th and 26th June, ...	2	...	...	...	...	...	...	No fall worth taking account of till 10th July.
XIV.	8th, 9th, 10th, 11th, and 12th August,...	5	1·527	1·597	1·48	1·629	1·50	1·675	5

2.—Sanitary Condition of the Saharunpore and Moozuffernuggur Districts.

In forwarding this report and the project of estimate (not printed) which accompanied it, the Superintending Engineer, 2nd Circle, submitted the following memorandum:—

1. In accordance with the orders of Government, North-Western Provinces, conveyed in Joint Secretary's No. 1987 I., dated 23rd November, 1870, Captain Harrsion, R. E., Executive Engineer, Eastern Jumna Canal, was deputed to investigate the sanitary condition of that portion of the Saharunpore and Moozuffernuggur Districts which lies between the Jumna and Hindun Rivers, and to submit estimates for such works as might be deemed necessary to improve the drainage of the country.

2. Captain Harrison, with his No. 13, submits a report with plans and two estimates for improving the Katha Nuddee. The first estimate amounts to Rs. 3,98,817, and the second to Rs. 3,54,834.

3. The country which Captain Harrison was to prospect is divided into two main sub-divisions by the Eastern Jumna Canal. In the Western Sub-division the main drainage line is the Katha Nuddee.

4. Captain Harrison in paras. 5 to 23 describes, with great minuteness, the topographical features of the Katha. In paras. 27 to 37 he explains the defects of the Nuddee, and the causes which prevent the Katha from affording full relief from the floods to the country it runs through. In the remainder he discourses the advantages of lowering the bed of the Katha, the impracticability of the diversion of the Hindun proposed by Colonel Fraser, and statistics of rain-fall discharges, &c.

5. The principle of Captain Harrison's scheme is to drain the sub-soil of the country. This he proposes to do by deepening the bed, and by rectifying the alignment of the Katha Nuddee.

6. The direct advantages to be derived by the execution of Captain Harrison's Scheme are—(1) the reclamation of about 900 *acres* of land, and (2) the increase of the land revenue by about Rs. 3,965.

7. The indirect advantages are the better sanitation of the country, and the reduction of reh.

8. The direct gains represent a gross income of about *one per cent.*

9. Of the first of the indirect gains no estimate can be made, as it is not a matter that can be calculated in £. *s.* *d.* No data are given by which the second can be computed.

10. Before remarking on the principle of Captain Harrison's Scheme, it will be as well to note here what are the errors of its details.

11. The errors seem to be—

1. The provision of masonry falls in a drainage line.
2. Admitting the advisability of the construction of such works, the omission of the element of time in estimating the volume, such works will be required to pass.
3. Estimating only for a channel to carry a discharge calculated at 1·25 cubic feet per square mile, and expecting the floods to clear out a channel required for a flood discharge calculated at 63 cubic feet per square mile.

12. Masonry falls in a drainage scheme, such as Captain Harrison's, or even in a line of any length, are objectionable. It would be more economical to provide for the surplus slope by adhering more closely to the present channel; again, the longer the channel the greater would be its retaining capacity, and consequently the greater the relief to the country, and the lighter though longer would be the floods.

13. Falls on drainage lines, supposing the necessity of such works, should not have waterway in direct proportion to the area of catchment-basin drawing into the drainage line at the point the falls are fixed. The element of time must be considered in determining the waterway of falls.

14. Captain Harrison has arranged for five falls thus (Appendix G.)—

No.	*Section.*	*Drainage Area.*	*Square Miles, Discharge.*
1	13	39	2,457
2	28	49	3,087
3	34	56	3,150
4	105	98	6,174
5	157	155	9,765

It will be noticed that the discharge has been taken throughout at 63 cubic feet per square mile.

15. Captain Harrison in Appendix F. gives the flood-discharge (calculated) at five points of the Nuddee, with the drainage areas, and the available discharge per acre—

32nd to 34th mile of Nuddee 55 cubic feet per square mile.

46th to 48th	„	32	„
53rd to 56th	„	33	„
61st to 63rd	„	15·4	„
68th to 70th	„	19·25	„

These figures prove conclusively the correctness of not apportioning the waterway throughout the length of a drainage line in direct proportion to the catchment-basin.

16. Captain Harrison, estimating only for a volume calculated at the rate of 1·25 cubic feet per square mile, expects the floods calculated at 63 cubic feet per square mile, to scour out the channel to the full width.

17. Though not quite true, yet for the purpose of showing approximately what must be the amount of earth removed

by the floods, the areas of the estimated and flood-channels may be taken to be in proportion to the dsicharge, thus—

Contents of estimated channel 38½ millions cubic feet.

Contents of flood-channels $\frac{38{\cdot}5 \times 63}{1{\cdot}25}$ =1,940½ millions.

Quantity to be removed by flood, ... 1,902 ,,

This quantity is equal to 150 *miles* of a canal, 100 *feet* wide, and 20 *feet* deep. To expect the floods to do this amount of work in even a hundred years would be far beyond the bounds of possibilities.

18. These quantities are of course subject to considerable modification due to the error of calculating the floods in direct proportion to the catchment-areas. The correct quantities would still be so large that their removal by the floods would require years and years to effect.

19. As to the principle of Captain Harrison's Scheme—

20. If the sanitation of the country can only be obtained by the lowering of the general spring-level then Captain Harrison's principle is sound, and may be said to be the only practicable one. Of course the plan would need modification in its details, but the main point, *viz.*, the construction of a channel on a line, the very opposite to the water-shed, with its bed considerably below the level of spring-levels, must remain good.

21. For if, as is undoubtedly the case, the general spring-level has been raised by the carrying of a large volume of water on the watershed of the country, and using that water in irrigation, a reduction in the level of springs must follow on the construction of a drainage line on the principles proposed by Captain Harrison.

22. The damage to the low-lying spots has been caused more by diversion and obstruction of drainage than by raising of spring-level.

23. Complaints of swamping of lands thrown out of cultivation by constant inundation, and of all the evils consequent on the interference with drainage, have been frequent in that portion of the country through which the upper part of the Katha runs. Seldom if ever has anything been said of the corresponding country through which the Kirsunnee flows, or of that through which the lower portion of the Eastern Jumna Canal is carried.

24. That portion of the Eastern Jumna Canal, which was remodelled by Captain Morton in 1854, crosses the heads of the Shamlee Nulla in more places than one. To relieve the country of the water held up by the canal banks, three drainage-cuts were made—*viz.*, Anutmow, Tholuh, and Gundewur. A glance at the map sheet, No. 2, will show how these cuts have affected the drainage of the Katha. Below the Gundewur Cut no swamps are met with. From and above the junction of the Gundewur Cut one-fourth of the country between the Katha and the canal is under water.

25. The country really needs either a re-diversion of the drainage intercepted by Captain Morton's canal, or certain rectifications of the Katha channel to admit of its carrying the extra water brought down by the Anutmow, Tholuh, and Gundewur Cuts.

26. The re-diversion of the drainage might be effected by the construction of syphons under the canal.

27. The rectification of the Katha channel would consist of—

1. Straightening the channel and lowering the bed of the Katha from about Hurpal—a village near the Katha Crossing of the Islamnuggur Rajbuha—to a short distance below the Gundewur Cut.

2. The construction of channels down the lowest line of the shallows lying between the Katha and the canal.

3. The diversion of the Anutmow and Tholuh Cuts.

8. A plan showing the cuts proposed in para. 32, section of the proposed bed of the Katha, and a rough estimate of the cost of the proposed works on the Katha have been prepared. The estimate amounts to Rs. 45,000.

29. The direct returns would be that noted in para. 6, *viz.*, Rs. 3,965.

30. The cost of maintenance and repairs be taken at Rs. 1,000 a year, and the net income at (3,965—1,000) Rs. 2,965, which would be a return of Rs. 6·6 per cent. on the capital.

CLINTON ANDERSON,
Supdy. Eng., 2nd Circle, Irrigation Works.

3.—*Note by* OFFICIATING CHIEF ENGINEER, *No.* 1723$\frac{I}{C}$., *dated 5th August*, 1872.

1. I BEAR most willing testimony to the care and the accuracy with which Captain Harrison has collected and recorded a very large amount of most valuable information.

I think he well deserves the acknowledgments of Government for the work done by him in this respect.

2. Of the five sections of the Katha mentioned by Captain Harrison in para. 24 of his report, it seems to me that only Nos. III. and IV. require to be dealt with. There are apparently no complaints about swamping in either sections I. or II., and the fall in No. II. is particularly good. No. III. is, as Captain Harrison remarks, an undeniable swamp, and No. IV. section is chiefly remarkable for irregularity of slope, and the persistent efforts of the villagers to block up the main

drainage course of the country. No. V. section I do not think that we are called upon to take up.

3. To my mind there cannot be a doubt as to the cause of the mischief now being wrought in section No. III. The whole tract is a natural depression, with a very insufficient outfall for the drainage which collects in it. So long as natural drainage alone had to be dealt with things went on smoothly enough; excellent crops of rice were yearly taken off the land liable to flooding, and if a portion of them was occasionally drowned outright, no one could quarrel with the course of nature. But with the extension of irrigation from the Eastern Jumna Canal came a marked rise in spring-level; reeds, bulrushes, and thatching grass have taken the place of rice, and loud complaints are very naturally heard.

4. I think that the Irrigation Department is in duty bound to drain No. III. by improving the outfall in No. IV. section, which operation will, at the same time, drain more or less completely the Chuchrowlee and other swamps bordering the latter section.

5. But having carefully considered the problem given us to solve, I must say that I cannot in any way support Captain Harrison's proposals. I consider them faulty in design, and that the minimun cost of his scheme (3½ lakhs of rupees) is out of all proportion to the results that may be expected from carrying it out. Mr. Anderson (paras. 12 to 19 of his memo. on the report and estimate) disposes satisfactorily of three grand errors in the design.

6. It is assumed in Captain Harrison's report, that if the floods are carried off with a free and uniform flow throughout the whole course of the river, the swamps in the upper part will disappear, which is quite true; because in order to carry off the floods as proposed, a deep channel must be made, which will at the same time drain off the collected spring-water. This last is to my mind the real source of the mischief, and I

would deal with it alone, until experience shall prove that more is required.

7. I therefore support strongly Mr. Anderson's proposal which is to start from a point in the river-bed at the 42nd mile just above the junction of the Gundewara Drainage Cut, and to work upwards with an uniform slope until the Seekherah Jheel is tapped. Mr. Anderson proposes to carry his cut right up to Hurpal, *i.e.*, to the head of No. II. of the sections into which Captain Harrison divides the river. I consider this quite unnecessary, as the fall in No. II. ($3\frac{1}{2}$ feet per mile) is already amply sufficient. I would therefore omit the upper six miles of his proposed improvement, and confine our operations to the portion of river lying between the Seekherah Jheel and Tail of the Gundewara Cut.

8. But I cannot understand how Mr. Anderson arrives at (20—6=) 14 miles as the length of river-channel between the above-mentioned points. According to Captain Harrison's Section (No. 3 of plans), the deepest point of the Seekherah Jheel is at the 19th, and the point selected by Mr. Anderson above Tail of Gundewara Cut, at the 42nd mile of the channel. No allowances for cutting off corners will, it seems to me, account for the difference of nine miles in the two measurements.

9. This question of length is a very important one to settle correctly, as on it depends the slope that can be given to the improved bed. If the distance be only 14 miles, as estimated by Mr. Anderson, an excellent slope of two feet per mile can be obtained; if it be as shown by Captain Harrison, 23 miles, then the slope of new bed will fall to 1·36 feet per mile.

10. I am doubtful whether the latter slope is sufficiently rapid for efficient working, and fear that with it the deep channel of river would be liable to be very much choked by weeds and grass. Should this slope be found insufficient, we must take up the channel from the 64th mile, from which

point we could work back to the deepest part of the Seekherah Jheel, with an average fall of one feet eight inches in a mile. But this would be a very tedious and expensive piece of work, in which we need not embark until Mr. Anderson's proposal is proved insufficient for our purpose.

11. And not even for the sake of obtaining the desired increase of slope can I approve of short cuts being made, *except under most favourable circumstances.* The present deep channel of the river should be closely adhered to, as unless the short cuts lie in the deep trough of the valley, and follow the general outline of curves already existing, the main current of the flood will not take to them, and they will very soon be silted up.

12. But the statement given in margin will show how much good will be done by a cut with even the reduced slope of 1·36 feet per mile, and as all work done in the smaller will come in use in the larger scheme, should it ever be found necessary to adopt the latter, there can be no hesitation in accepting Mr. Anderson's proposals.

Mile of River.	Situation.	R.L. Present bed.	R.L. Bed improved.	Will be lowered.
				Ft.
19	Deepest part of Seekhera Jheel, ...	841·70	841·70	...
23	Outlet of „ „ ...	843·74	836 26	7·48
30	Junction of Anutmow drainage Cut, ...	833·66	826·74	6·92
35½	„ „ Tholuh „ „	821·00	819·26	1·74
39	4 Bunds in 1½ miles,	817·00	816·50	2·50
42	Junction of Gundwara Drainage Cut,	810·40	810·40	...

13. The only objection that can possibly be urged, as far as I can see to stopping the improvement of channel at the 42nd mile, is, that the water brought down to that point could not be carried off by the channel below as fast as it was delivered. Of this there is, I think, no fear. I look upon it as most unlikely that a slope of two feet per mile can be obtained for an improved channel that shall thoroughly drain the Seek-

herah Jheel, and the average slope of the river-bed from the 42nd to the 64th mile is ·93 feet, the average slope in the nine miles immediately below the end of the proposed improvement being 1·82 feet per mile.

14. But it is imperatively necessary that all embankments across the river channel, and any other obstructions to the free flow of the water shall be removed, and their renewal be strictly forbidden. I cannot agree with Captain Harrison in the opinion that the numerous bunds have not injuriously affected the river-channel. The Katha floods do not, as a rule, bring down *silt* (their *velocity* being comparatively low) but *mud*, the deposit of which in river-bed would not be very noticeable. The bunds all lie between miles 28 and 59. Now in Appendix B. of his report Captain Harrison gives average slopes per mile—

Between miles	28 and 32	=	0·99	Feet.
„ „	32 and 48	=	1·52	„
„ „	48 and 58	=	1·19	„
„ „	58 and 61	=	1·48	„
„ „	61 and 64	=	2·44	„

According to the laws of a hydraulic, the slope of a river-bed should *decrease* and not *increase* as it flows onwards, and it is, to say the least of it, a curious coincidence that the bunds and irregularity of slope should occur in the same section of river.

15. Mr. Anderson has been requested to employ Mr. Archer in arranging and digesting Captain Harrison's notes and observations made in connection with the "special drainage survey," and I would recommend that the papers connected with this scheme be returned to him with a copy of this note. From the very full information given by Captain Harrison, an accurate estimate could be drawn up by Mr. Archer of the probable cost of carrying out Mr. Anderson's proposals, as modified by me, and this could be dealt with by us, or submitted to the Government of India for sanction according to its amount.

I have already said that the cost should, in my opinion, be borne by the Canal Department. The work will be both difficult and expensive, and I do not form any very high estimate of the profits (in money) likely to be obtained from its execution.

But we are in duty bound to carry it out, and must, therefore, face it with all its difficulties as best we can.

H. A. BROWNLOW, LIEUT.-COL., R.E.,

Offg. Chief Engineer, Irrigation Works, N.-W. P.

4.—MINUTE BY HIS HONOR THE LIEUTENANT-GOVERNOR, NORTH-WESTERN PROVINCES.

Katha Drainage.—The enquiries so elaborately made and carefully reported by Captain Harrison relate to the western side of the Eastern Jumna Canal, in the tract of country where the canal passes from the Saharanpore into the Moozuffernuggur Districts, and they extend to some distance above and below that point.

Nature seems to have provided two systems of drainage for this tract—namely, the Katha Nuddee on the west, falling into the Jumna; and the Kirsunnee Nuddee with the Shamlee affluent on the east debouching into the Hindun.

The canal, as remodelled by Colonel Morton, took the line of the Shamlee Nuddee, crossing and re-crossing it, and consequently cutting off and leaving on the west drainage lines which naturally turned towards the east. Some of the chief evils now brought to light appear to owe their origin to this interference with the natural drainage of the country.

The natural remedy would be to re-open the drainage eastward by under-passages from west to east across the canal. But this, it is shown, would be too expensive an operation. It remains, therefore, to improve the drainage as best it may on the western side.

The criticisms of Mr. Anderson on Captain Harrison's great scheme appear conclusive, and I concur in Colonel Brownlow's modified proposals, based on the Superintending Engineer's limited project, for improving the drainage in the third and fourth sections. A clear benefit will be gained by carrying off the water which now rests as an incubus on this tract—namely, from about Hurpal to Teetron. The effects can then be watched, and if anything more be subsequently needed, there will be this advantage, as the Chief Engineer says, that what is now done will be so much completed in furtherance of such additional project.

I observe that of six escapes which tail off in this direction there is only one (the lowest) that can be used without damage, and that one it is said can be used "*without much injury.*" I should wish it to be considered whether the remedial works now proposed will enable the other five to be used without injury, and if not, what further remedy is necessary; for evidently our rajbuha tails should not be allowed to run at all in such swampy parts unless the water can be run off completely.

I also observe that the Bhynswal Drain is said to be ineffective, and to require lowering of bed; but, as this will involve improvement of the channel from mile 64 upwards, it may stand over for the present. Although the dams thrown up by the people are said not to have injured the channel, there being no silting, yet where the object in view is the draining off of spring-water, it is evidently most unadvisable to permit the continuance of these obstructions. By the New Canal Bill we shall have power to remove them.

Further report is promised on certain water-logged villages unfavourably reported on by Dr. Cutcliffe. This must not be lost sight of.

A report is also promised on the villages which are over-irrigated, and it is said that this will be taken up in the ensuing khurreef fussul. This too must be kept in view.

The eastern drainage on the Kirsunnee remains still to be reported on.

Although Captain Harrison's project has not been approved, still, as observed by Colonel Brownlow, he deserves much commendation for the labour he has bestowed on this investigation. His description of the Katha Valley is most valuable, and should be published, with an indication of the remedial measures now applied, in the "Selections."

6th July, 1872. W. M.

Art. XXIV.

VISIT OF THE LIEUTENANT-GOVERNOR TO THE THOMASON COLLEGE OF CIVIL ENGINEERING, ROORKEE.

On Thursday, the 28th November, the Lieutenant-Governor, in company with Mr. Lind, the Commissioner, Colonel Fraser, R.E., C.B., and Colonel Brownlow, R.E., Chief Engineers, Public Works Department and Irrigation Branch, and other Chief Officers in attendance on His Honor, visited the Thomason College of Civil Engineering. After Sir William Muir had inspected the various Departments at work in their several class-rooms, all the students, English and Native (numbering altogether nearly 200), were assembled in the College Hall, when His Honor addressed them to the following effect:—

"Major Lang, Professors, and Students—

"On previous visits to the College, I have contented myself with an inspection of the various classes, and have never as yet addressed you collectively as I now do.

"The reason, you know, is that the ordinary opportunity for such an address, the Annual Examination and Distribution of rewards, occurs in September—a time of the year when it is not always convenient to visit this place. Two years ago I had arranged to preside on that interesting occasion, and was on the point of starting when I was prevented by an unexpected cause wholly beyond my control.

"But I feel that I cannot pass over the present visit in silence. It is the last opportunity I shall have of visiting an Institution in which I have always felt the deepest interest; and there are associations connected with noble and distin-

guished men, some of whom have now passed away, which bind my affections closely with it. The College owes its origin to the wisdom and foresight of that great statesman whose name it bears. In view of the vast and increasing necessities of India for engineering talent, both European and Native, Mr. Thomason projected this Institution to train up Officers and Civilian Students to be Engineers of the highest class, and also to provide an opening for deserving soldiers and others in the lower grades: and, more than all, he felt that opportunity and encouragement should be given to the people of the country to qualify themselves for being their own Engineers. Like all the great designs of what wise ruler, the scheme was one eminently fitted to grow and expand into practical usefulness, and to be a blessing to the country. We need look no further than to what we see here to-day in proof of this. I well recollect with what lively pleasure Mr. Thomason received the full approval of the Honourable Court of Directors to the project, the details of which, with a sketch of this building as it was to be, he embodied in a prospectus; and it was one of my earliest official acts as his Secretary to affix my name to this, with the intimation that it had been cordially sanctioned by the Honourable Court. In looking back to the origin of the College, we may well do so with an ever affectionate remembrance of its Founder.

"Although the College has been less than five and twenty years in being, hallowed associations already cluster around it. Cautley, Baird Smith, Dyas, and Turnbull were successively its visitors, and they have all passed away from us. The site on which it stands is aptly chosen, looking down as it does on these noble monuments of engineering skill by which the Canal (itself no mean river) is carried from Hurdwar across the intervening valleys and mountain torrents—a lasting memorial of the skill and daring of Sir Proby Cautley.

"The College is also full of associations of the good and able Officers who have filled the office of Principal (an office

so well discharged at the present moment by my friend, Major Lang),—Oldfield, Maclagan, Williams, and Medley; and also of distinguished students, of whom the memory of one—Lieutenant Lillingston (for three years my Private Secretary), who here acquired his knowledge and his love of engineering—is specially cherished by me.

"But apart from personal associations, there is a reason which renders the present moment one of public interest. The establishment in England of an Engineering College for India has unsettled the minds of the public here as to the prospects of this Institution, and the continuance to it of the patronage of Government. It has been a subject of much anxiety to myself, and of correspondence with the Government of India. It is, therefore, with sincere satisfaction, I am able to announce to you, and through you to those without who are interested in the Thomason College, that the Institution at Cooper's Hill will in no degree affect the relations of the Government of India with this College, nor the employment which has hitherto been guaranteed to its more successful students. Between the two Seminaries there will be no opposition or antagonism. The requirements of this great country are ample for both. I am sure that you will all with me be thankful to the Governor-General in Council for the justice which has thus been rendered to the Roorkee College.

"I will now address a few remarks to each of the several Departments, and first to the Engineering Class, composed of Officers, Civilians, and Native students. It would be superfluous to exhort the high-minded British Officer to exertion; his spontaneous presence here is proof of the resolve that his career shall be a useful one. I have already mentioned one accomplished student now gone, whose example you may well set before you. You have another now present in Captain Brown, V.C., some time Assistant Principal in the College, and now Assistant Secretary in the Public Works Department; and if need were, other names might be given you.

And so with the Civilian class—their aims and resolves, I am sure, will not be less high. And here, too, there are not wanting examples to set before you for imitation. We have Clinton Anderson, a student of 1851; now a Superintending Engineer; R. Forrest, a student of 1853, who has risen with credit through every grade, and who for several months officiated as my Chief Engineer in the Irrigation Branch; we have Nelson, Evans, Palmer, and I cannot omit the name of that most meritorious student, Willcocks, who passed last session with such distinction, and who will, I am sure, rise to an honourable position.

"Gentlemen of the Engineering Class;—Yours is a noble profession, and for its exercise in India there is the widest scope. The material improvement of the country depends on your exertions. It is to you we look for roads to open up the country; bridges and buildings for its convenience; canals to avert the calamity of drought, and to scatter prosperity and plenty over the land; railways to promote merchandize and traffic; and drainage to ward off malarious influence from our cities and our villages. And this material prosperity will, if used aright, lead onwards to social elevation. To take but one Department of those I have alluded to:—Railways have exercised a more powerful effect than perhaps all our educational institutions put together in enlightening the Native mind; and if we could but encourage the middle and upper classes, by securing the privacy of female passengers, to give their women the advantages of travelling by railway, it would, I am convinced, do more than anything else towards the enlightenment of the people and the improvement of their social usages, by breaking down the cruel custom of seclusion, and admitting the women as well as the men of India to the benefits of travel, the enjoyment of the beauties of nature, and the free air and light of heaven."

Turning now to the Native students of the Engineering Department, Sir William Muir said this was the class of

all others to which Mr. Thomason looked for benefit to India, by engrafting the science and practice of the engineering art on the Native mind, and so rearing an indigenous body of Engineers capable of carrying out their own works. For this end he had founded six scholarships, each of Rs. 50 per mensem. Sir William Muir had with this view jealously guarded the appropriation of those scholarships to Native candidates, and rejected proposals for even their temporary application to other classes. As yet, however, he was sorry to say that the class had not answered the expectations of its founder. For some years there were no Native students at all, but latterly he was glad to see that the class had begun to revive. Last year there were two candidates from these Provinces, but they quitted the College before completing the course. Now we had five, of whom two were from the Punjab and three from Bengal. This class had produced one bright example of what might be achieved by Native Engineers, in Rai Kunhya Lall, a student of 1852, who was now the Executive Engineer of the Lahore Division, and as such, in charge of all the Military buildings there, and taking his position with the Civil and Military Officers of the Government. His services were so well appreciated, that some years ago the title of "Rai" was conferred upon him by the Government of India. There were other names of useful Assistant Engineers which he could mention, and he trusted that the art might yet become popular among well-educated Native youths of social standing. There was no reason why it should not, nor why they should not aspire to the highest engineering offices of emolument and rank in India thus thrown open to their ambition. It were an object well worthy Native gentlemen possessing the means, to aid the benevolent designs of Government in establishing scholarships or prizes to encourage the youths of Hindustan in this noble aspiration. Instead of five or six, we ought to have at least fifty or sixty Native students in this class; there was an ample opening for them, and he was sure that Mr. Kempson, the Director of Public Instruction, would aid in every way

in his power in encouraging well-qualified students to come forward from our Colleges and swell the ranks of the class.

The Lieutenant-Governor next addressed the Upper Subordinate Class, which is composed chiefly of soldier-students. "Complaints," he said, "have not been wanting against the efficiency of the Supervisors from this class; and in the otherwise favourable orders of the Supreme Government mentioned before, I have been desired to consider how far these complaints are well-founded, and how they can best be remedied. On both these points we have corresponded widely with engineering authorities; and I cannot conceal from myself that, as a whole, this class has not as yet fully answered the object of its existence. The men go forth trained, it is true, in the theory of their profession, but not in its practice. As practical Overseers they are for the most part found useless. I am far from saying that this inefficiency is universal, and there are many marked exceptions of useful and practical subordinates, bringing, moreover, to their work the true English attributes of courage, promptness, and ready resource. For example, we have here to-day Mr. Keay, who has risen to the rank of Assistant Engineer, and holds Her Majesty's Commission of Ensign, and, as Head-master of the College, has supplied one of the most valuable papers on the remodelling of this class. We have Mr. Peart, who, as District Engineer of Goruckpore, takes his place as one of the officials of the district. We have Caernarton, McArthur, Perry, Murphy, Laing, Bradley, Conduit, Innes, and I could give many more names of good and useful men from this your College calendar. But after all, of the hundreds that have passed through the College, these form but a mere handful. The great majority fail: too often, I grieve to say, fail from want of steadiness, and sometimes even of integrity, but also for the most part from want of practical training. The remedy for this has long been a matter of anxious consideration, and yesterday it was discussed at a conference of the able and experienced Engineers

whom we have assembled here. I will briefly mention the conclusions we have come to. The College course will be extended to two years; it will embrace a more thorough grounding in the profession, and also a knowledge of Oordoo. At its close, the men, instead of being placed at once, without experience and training (as they now are) in charge of works, will pass the probation of a third year as student-apprentices. They will be under the charge of an experienced and judicious Supervisor in small batches of five or six, at places where some great work may be in progress, and there gradually initiated in the practical duties which they will be called to discharge. At the close of this period, if found competent, they will be confirmed in the Upper Subordinate rank, or otherwise remanded.

"These are the main charges now proposed, and if sanctioned by the Government of India, I have every hope that they will prove an effectual remedy and means of practical training. But there are other, and I fear too often less remediable defects;—defects in tact and temper, in sobriety and integrity. There will now be a longer period for testing character, and the opportunity will be taken for freely weeding the ranks. No hesitation will be allowed in remanding to his regiment any man who, during these three years of probation, gives way to intemperance.

"Tact and temper, though often complained of, are less easily to be tested. There is too frequently an utter want of sympathy between the Overseer and his labourers. He does not feel for them, or even understand them. He pushes them and knocks them about as he would a wedge or a pickaxe. Now, there are two ways of getting your instruments to do their work, and this certainly is not the way to get it well done. If you treat them as fellow men, in a kind and friendly manner, taking an interest in their comfort and their well-being, they will serve you to far better purpose. And I would ask you what, after all, we Englishmen are here in India for?

Is it simply to dig and build? Is it not rather that we should raise and elevate the people—make them the happier and the better for our being here? There is not a single man amongst you but will have it in his power to do so. The Natives of the country judge very much of what an Englishman is by how you as a body treat them. It is a noble sight to see an overseer with a real interest in the welfare of those about him,—known as a friend of the people, and instead of abusing them, and driving and knocking them about, having them to follow and work, because they trust him, and respect and love him. Such a man will not only build his bridge or dig his canal well: he will be doing his duty as a moral agent, and adding his influence to build up with credit and honour the Christian and the British name in India.

"A better knowledge of Oordoo will, I feel confident, tend to this good end. Too often the overseer cannot understand his labourer, or make himself understood; and so he loses his temper, and abuses or strikes, where a complete understanding of what was meant on either side would have obviated all this. Our two years' course of Hindustanee will cure this want. But something more is needed, and that is sympathy. I am well aware of the danger to those who are employed exclusively in the study of exact science, engineering problems, or material works, in the disuse of the finer sympathies of our natures; in all this there is a tendency for the better susceptibilities to harden or deteriorate. Now, to counteract this tendency, you should spend some parts of your time in the cultivation of letters. The Poet says:—

> 'Nourish Imagination in her growth,
> And give the mind that apprehensive power
> Whereby she is made quick to recognize
> The moral properties and scope of things.'

I know that you have not much time for anything beyond your professional work; but still you may find some little opportunity daily for other reading, and even *a little*, if properly selected, will help to cultivate the affections and turn your

minds to those 'moral properties and scope of things' which the Poet rightly urges us to cherish. But there is a better and a surer source of sympathy, and that is Religion. Don't be ashamed to study the Bible and to observe the Sunday. Take my advice, my men, and keep that day; keep it, as far as you can, free from secular intrusion. You will find in the sacred subjects suitable to it the surest springs of true humanity and sympathy:—softening and elevating influences to counteract the deteriorating tendencies of which I spoke. And, my friends, Religion will stand you in good stead in yet another way. It will help you to resist those temptations to which, especially in your lonely life, you will be exposed,—temptations to intemperance and dishonesty. Your self-restraint, integrity, and virtue will often be put severely to the test, and you will need higher motives than this world's morality to resist the trial. 'Godliness,' we are told, 'has the promise both of this life and of that to come.' I trust that you will seek it for the higher promise; yet that will surely bring the lower in its train. It has often pained my heart more than I can tell you, to receive the report of some otherwise good Overseer having become a victim to drink, and found myself forced to close the door of employment and promotion, and to send him back to his regiment a ruined and hopeless man. Seek, then, to fortify yourselves in sobriety, temperance, and virtue, and to steel yourselves against the temptation that will assail you by the high and powerful motives our holy faith supplies. And be sure that the Government is resolved at every step to weed out the bad men, and to insist that those who remain shall be temperate, as well as honest to the back-bone."

The Lower Subordinate Class being composed entirely of Native students, the Lieutenant-Governor addressed them in the Oordoo language. He pointed to the defects of listlessness and peculation as the failings before which the Lower Subordinates too often succumbed, and urged them to habits of activity, and to promptitude and energy in carrying out thoroughly the duties entrusted to them. There was

endless scope for their employment in all the great engineering works now in progress or projected; and with integrity, skill, and energy, they were sure to rise in their profession. He was glad to see so many candidates for employment from the schools in these Provinces. These, however, were mainly from the upper districts in this vicinity. It would be the care of Mr. Kempson, the Director of Public Instruction, to see that pupils were encouraged to come from the more distant Provinces also, and to provide means and facilities for that purpose, so that the benefits of this useful class might reach to every District.

In conclusion, Sir William Muir, turning to the Principal, Major Lang, thanked him cordially for his devotion to the interests of the College. It was to his exertions, and those of his predecessor, Major Medley, that he found the classes so crowded and the teaching so effective; and his thanks were due also to the several Professors and to the College staff in general. On this farewell visit it was to him a matter of regret and pain that he should not again be amongst them. He trusted that the measures which had now been devised would tend greatly to the efficiency of the College, and he would always look with interest for tidings of its prosperity and success. He was sure that it was proving a blessing to the country, and that it would answer its object in not only qualifying Europeans of every rank for the profession, but (a work beyond the power of any English College) in engrafting the Engineering science on the Native youth of Upper India.

Art. XXV.

REPORT ON THE VERNACULAR NEWSPAPERS AND PERIODICALS PUBLISHED IN THE NORTH-WESTERN PROVINCES DURING 1872.

1.—*From* M. KEMPSON, ESQ., *Director of Public Instruction, North-Western Provinces, to* C. A. ELLIOTT, ESQ., *Secretary to Government* (*No.* 4532).—*Dated Allahabad, the* 25*th March*, 1873.

I HAVE the honor to submit, for His Honor's orders, statements showing the particulars of language, locality, and circulation of the Native newspapers and periodicals published in the North-Western Provinces during 1872, with the following remarks:—

2. The number of newspapers published in 1871 was 30, with a circulation of 7,594 copies. In 1872 the corresponding figures are 36 newspapers, with a circulation of 5,917 copies. The new entries are the *Buddh Prakásh*, Allahabad, a Hindi version of the *Núr-ul-Absár*; the *Prayág Dút*, Allahabad, a Bengali journal; the *Muhibb-i-Hind*, Meerut, an Urdu paper published by the editor of the *Lawrence Gazette*; the *Nagrí Prakásh*, a Hindi version of the same; the *Lauh-i-Mahfúz* (Urdu), Moradabad, and the *Saunders' Gazette* (Urdu) of Shahjehanpore.

3. In 1871-72 sixteen papers were subscribed for in the Department of Public Instruction, the number of copies taken varying from 250 to 30, as shown in my last report. This year thirty papers have been patronised, but the highest number of copies of any one paper taken was 100, and the lowest 20. Those of which the highest number has been taken are, of the Urdu journals, the following, *viz.*, the

Núr-ul-Absár and the *Áínah-i-Ilm* of Allahabad, and the *Allygurh Institute Gazette;* and of Hindi papers, the *Buddh Prakásh* of Allahabad, the *Mangal Samáchár* of Beswan, and the *Kavi Vachan Sudhá* of Benares.

4. The largest circulation of any one paper is 381, the *Allygurh Institute Gazette,* which has fallen from 462, owing to a reduction in the number of copies taken by the Government. The next highest circulation, 316, is enjoyed by the *Dabdaba-i-Sikandarí* of Rampore. The paper most patronized by European readers is the *Agra Akhbár,* no other paper approaching it in this respect. The returns are received direct from the editors, and I see no reason to challenge the entry of 150 copies in this column. The editor is the chief Munshí in the Agra College. Last year the *Allygurh Gazette* had 47 European subscribers; this year the entry is 38. The paper most patronized by Native readers, according to the registration, is the *Dabdaba-i-Sikandarí,* which has 247 Native subscribers. The Bengali paper at Allahabad comes next with 225 subscribers. Last year by far the most popular newspaper with the Native public was the *Lawrence Gazette,* which was recorded as having 825 subscribers. This year the entry is 200 only, and the total circulation of the paper has fallen from 1,065 to 305 copies. I imagine the editor has been clearing his books of non-paying patrons. The average circulation of each paper on the list has fallen from 253 to 162, but the redistribution of Government patronage has tended to equalise the actuals. It is difficult to see the *raison d'être* of at least one-half of the Native journals, but the possession of a press necessitates the employment of the workmen, even though the profits are nominal, and then there is the hope of Government support, and some importance attaches to editorship as a profession.

5. Native opinion on the subject of the patronage given by Government to the Native Press, and its results, was stated with apparent candour in the May number of the *Delhi*

Institute journal. In the article referred to the comparatively large number of newspapers published in the North-Western Provinces, as compared with the Punjab, is said to be caused by the plan of purchasing copies for use in schools. The quality of the papers, however, is not thereby improved, for the Punjab journals which received less encouragement of the kind are as good as those in the North-Western Provinces. The contents of the majority are borrowed without acknowledgment, and there is no enterprise in the way of collecting reliable news or publishing original articles. On the other hand, the Government is said to be wise in promoting the circulation of the papers, as a means of creating a taste for reading, observation, and inquiry. The papers now often find their way to the village *choupál*, and furnish topics for conversation which would otherwise be unthought of. The rustics even come considerable distances to hear the papers read. I think the above remarks are a satisfactory reply to those who object to this mode of giving a *locus standi* to respectable Native prints. The public is no doubt not yet alive to the advantages of a free press, and is unaccustomed to independent expression of opinion or free comment on the acts and orders of the ruling power. The majority are indifferent to all but selfish interests. They distrust each other, and do not care to spend money except upon recognized needs. But other feelings may be called forth, and it is certain that a desire for reading and information once created will find food for the satisfaction of the curiosity which is implied.

Our schools reap, moreover, a peculiar benefit in another way, and that is the extension which is insensibly given to the vocabulary of teachers and pupils, and their power of expression. This is a matter of some importance now that written examinations are likely to demand a higher tone of exactness.

6. In respect of the issues of 1872, the Reporter's translations and epitomes have given a fair general idea of the sub-

jects chiefly discussed and the interest represented, but many articles can be appreciated in the original only. For instance, *animus* and self-seeking, as in the case of communicated articles and correspondence in the local English papers, are often obvious in the tone of expression or in the turn of a phrase, whereas the Reporter's epitome may read as a public spirited editorial. On the other hand, the substance of a ponderous word-weighted column is often admirably conveyed in a few words. Editors are well aware of the existence of a Government Reporter, and some have suggested that copies of his abstracts should be circulated for their information.

7. The one topic of 1872 which at the time engrossed the attention of all Native newspapers alike was the assassination of the Governor-General at Port Blair. Many editors issued "Extras" with black borders in token of mourning, and some paid a tribute of sorrow in poetical laments in the overloaded fashionable style. The Reporter thus expressed the general feeling:—"All vernacular newspapers in Upper India record with feelings of deep sorrow and sincere and heartfelt grief the melancholy news of the universally lamented death of the late Viceroy and Governor-General at the hands of a cruel and barbarous assassin."

The event was calculated to create a strong sensation, for in the eyes of the native the Governor-General of India is the personification of paramount and irresistible authority. The violent deaths of dynastic rulers have been common in Indian annals, but as no power in India has ever reached that of the British Government in vigour and extent, so the fall of its chief excited a corresponding awe in the minds of impressionable men. None of the papers regarded the occurrence as having a political significance. They thought that fate took the Viceroy to the Andamans, and that want of care when there made the work of the assassin easy; one or two regarded the appearance of the Aurora Borealis, which was said to have been visible in Oudh early in February, as

a presage of the misfortune. The *Benares Akhbár* took occasion to attack the Mahomedans as politically a dangerous class, and reminded them that one who wished them well was their victim, but wiser editors avoided a reproach so harsh and inconsequent. The subject continued to be noticed from time to time in connection with the mode of expending the memorial money. The *Kavi Vachan Sudhá* had the bad taste to suggest that it should be applied to relieving overtaxed Natives, or to the support of Native orphans in lieu of making them over to missionary care. Others suggested that the erection of a large serai in Calcutta would be the most suitable memorial.

A letter from a Mahomedan Professor in Dublin was published in one of the Lucknow papers (July) to the effect that the Indian Chiefs by meagre and lukewarm support of the memorial had lost the opportunity of making "the Irish members" their grateful champions in Parliament, and bid them remember that it was an Irishman who denounced the (supposed) misrule of Warren Hastings.

The same paper thought it hard that the pension voted to the illustrious widow should be charged to the Indian revenues, and said it was taxing a nation for the crime of a convict, who should have been better looked after.

The Kuka outbreak attracted comparatively little notice, but the action of the Government in discountenancing the mode of punishment adopted was approved. The *Akhbár-i-Alam* suggested that the officer in fault, if he wanted to make an example, would have done better to have cut off the ears and noses of the rebels, and put them in prison under sentence of perpetual flogging.

The third topic of general interest was His Honor's Resolution in reference to the fine imposed on the editor of the *Benares Akhbár*. The feeling was that the liberty of the press was no longer a mere name, as had been supposed.

8. Matters of domestic and political interest undoubtedly occupy the largest share of attention by the Native Press. Foreign politics are untouched, except that here and there the deeds, good or bad, of Native rulers receive comment. Matters connected with the judicial branch of the administration receive far more attention than questions relating to the revenue or settlements, which are rarely noticed. The *Allygurh Gazette* and other papers call for trial by jury. They object to the employment of uneducated men as assessors, and to the carrying out of sentences under appeal. An Agra paper (January) sings the praises of the old Sudder in contrast with the High Court, in which interpreters and advocates are wanted. The Police and Post-office are often commented upon unfavourably, but no suggestions of value are made. The *Benares Akhbár* complained that copies of the journal sent to the address of the late Kotwál of Benares in Meerut had failed to reach their destination, but as in a former number it had recorded the fact that this person was in jail there, the explanation was obvious.

The *Lawrence Gazette* (January) had an anti-Dilkian argument in favour of monarchy, and ridiculed the objection felt by democrats to being called "subject." The same paper, in a June number, advises the adoption of the plan of *Bait-ul-mál*, formerly a practice under Native Government, by which escheats and lapsed estates were devoted to charity instead of confiscation. The *Akhbár-i-Alam* (August) published an article by Lalla Luchmi Narain, of Bareilly, in answer to the positions advanced by certain European and Eurasian memorialists with reference to the employment of natives of India in the public service. The *Núr-ul-Absár* followed this up effectively. A number of the *Shola-i-Túr*, of Cawnpore, had a forcible, because practical, article on the oppression suffered by the people at the hands of petty Native employés under Government. The following six classes of petty tyrants are named—(1), Chuprassees in the Irrigation Department; (2), Chuprassees in the Chungí; (3), Chuprassees in the pub-

lic offices; (4), Police constables; (5), Railway employés; (6), Village chowkeedars. The same paper (January) complains that Sub-Assistant Surgeons, especially Bengalís, take advantage of the rule which requires a certificate of ill-health when leave is wanted to extort money. Among subjects of local importance, the *Lauh-i-Mahfúz*, of Moradabad, a new paper, comments on the misfortune of Kashipore in being detached from the district of Moradabad. The editor is probably right, for he expresses the sentiments of the rajah of the place. Strong remonstrances against municipal taxation in the Magh Melá at Allahabad appeared in the *Núr-ul-Absár*. These articles say nothing of the private extortions of the Prágwáls, which are complained of by the *Kavi Vachan Sudhá* (April). A cleverer article appeared in the former paper in August about the prohibition of the Shva Koti Fair. The sanitary grounds put forward for the non-observance of the festival are approved, but the editor thinks it no small merit that 50,000 Hindoos gave up their observances to please the Government, and blames the *Pioneer* for being oblivious to the fact, ever ready as it is, in the editor's opinion, to satirize Native shortcomings.

The Benares papers frequently complain of bad sanitation in that city.

9. Educational and literary topics are confined chiefly to such papers as the *Najm-ul-Akhbár*, of Meerut, and the *Agra Akhbár*, both of which are partly conducted by educational employés, or to the *Núr-ul-Absár* and the *Allygurh Institute Gazette*, which latter is the advertising medium of the Mahomedan College projectors. Other papers mention matters connected with education incidentally only.

The scheme for the Mahomedan College or University appeared in the *Allygurh Institute Gazette* of May 24th, and has been discussed off and on by several writers. The proper site for the institution was debated, and Allahabad, Agra,

Lucknow, Delhi, and Allygur h were variously recommended. The last named place was intended by the leading projector of the scheme all along, and is the locality chosen irrespectively of public opinion. The scheme itself is visionary in character, and the expected results can be realized but slowly, if at all, for the principles advocated by the progress party are too far in advance of the average views of the class which it is intended to benefit.

The establishment of the Muir College at Allahabad was noticed with satisfaction, but some alarm accompanied the announcement lest the existing colleges should be broken up.

The *Najm-ul-Akhbár* and the *Allygurh Gazette* had complaints regarding the pay of village school-teachers, and the former used the proposal for instituting a written vernacular examination as an argument against low pay. The *Agra Akhbár*, which should have been better informed, gave out with much satisfaction that the use of the vernacular in the Calcutta University Entrance Examination would be allowed in future. The editor is in advance of the times in this instance.

The Durbar rank of the Deputy Inspectors of Schools was canvassed by one or two papers as being unduly low. The reduction of their travelling allowances and establishment was also lamented as a step in the wrong direction. The mixture of reason and unreason, and the tendency to exaggerate, which marks complaints of this nature, deprives them of their effect.

Female education is not so often treated of as before. It is now quite well understood what the part taken by the Government is, and the subject excites no controversy. The *Lauh-i-Mahfúz* (August) made a sensible suggestion, with probable reference to the Girls' School in Moradabad. The gist of this was that female schools should be allowed to exist at the houses of men of position and respectability only, that

Normal Schools should be opened in all large towns, and, generally, that none but men of established character should have to do with female education.

A March number of the *Allygurh Gazette* had a literary article on the beauties of oriental poetry; books are not often mentioned. The Persian and Arabic selections used by the Calcutta University were commended with the exception of the *Sullam-ul-Adab*. Educational books were stigmatised as dear by the *Dabdaba-i-Sikandarí*, and in relation to this I shall have occasion to notice the remedy which is being applied by Press proprietors in my remarks on the books registered under Act XXV. of 1867.

Under this head I remark lastly an article which appeared in the *Núr-ul-Absár* on Municipal Free Schools. The writer objected to their institution on five grounds, *viz.*:—(1) that idlers were chiefly benefitted; (2) that eleemosynary education is wrong in principle; (3) that a smattering of learning does more harm than good; (4) that the lower castes will rise above their legitimate status; (5) that they will abandon their calling, and be less useful than they are at present.

Feeble as these objections are, they are just those which are intelligible and acceptable to Native sentiment.

10. Of social and miscellaneous topics, the chief is the crusade still manfully waged by Moonshee Piyarey Lál in the face of enormous odds against marriage ceremonial extravagance. A man of one idea is often a nuisance, but the cause in this instance is one which involves the happiness of thousands. A class of crimes, cruelties, and immoralities, which evade the law, is behind the scene, and I cannot but think that the Government should complete the work by magisterial influence. Success has been achieved in many localities, but it wants a Hercules to cut off all the heads of the serpent. A re-action must be expected after the excited

feelings which crowded meetings produce have passed away, and old habits crop up again unless they are repressed. It was a remarkable expression made use of by one of the Collectors, in reference to the desire for reform in this direction, that the presence of an "enthusiast" was necessary to initiate the movement in his district. He might have added that his own influence would be necessary afterwards to carry it out. All the Native newspapers which notice the measures taken by Moonshee Piyarey Làl approve of them, but one or two, *e. g.*, the *Agra Akhbár* and the *Kavi Vachan Sudhá*, predict failure unless some more powerful and lasting machinery is contrived than he can organise unaided. The former paper, in a September issue, states that some classes of Kayasths who have agreed to adopt the rules, also secretly agree to break them when it suits their purpose. They conceal their expenditure occasionally, but the fact that they do so proves that public opinion is really against them, and an argument is gained by the promoters of reform. As the organ of this party, the *Mangal Samáchár* of Beswan is the most important paper published in these Provinces.

11. The means of promoting friendlier intercourse between Natives and Europeans still forms a theme of discussion. The *Kavi Vachan Sudhá*, in a September issue, devoted a long article to prove that as far as the Hindoos are concerned, cow-killing is the bar to an amicable feeling. A curious story of Akbar is quoted in illustration of the good effect of his yielding to this popular prejudice of his Hindoo subjects.

The ill treatment of Native passengers by rail is constantly brought up, and the inconveniences to which female travellers are subjected is repeatedly noticed. The employment of female collectors and servants said to have been introduced by the Oudh and Rohilkhund Railway Company is hailed with satisfaction. The *Lauh-i-Mahfúz* (June) noticed the reported conversion to Islám of two Bengalí boys by their Persian tutor at Bareilly. This was magisterially investigated

at the time. The boys had expressed a wish to adopt a new creed, but their guardians had prevented the completion of the act, and they were eventually withdrawn from the influence of their instructor.

A November number of the *Allyghur Gazette* printed a pasquinade on the ignorance of the vernacular displayed by Europeans. This was given as a dream in the form of a dialogue. The *Núr-ul-Absár* followed with a story of a summons served on one "*Mutawaffa*" by a Civil Officer. The editor thinks that more command of the language was acquired formerly by European officers from their habit of studying Persian.

12. More might be added to this report, but perhaps enough has been said to indicate the general character of the subjects treated of. The interests represented are undoubtedly in the main those of the Native public, and in saying this I mean to pass an encomium on the Native press. His Honor himself reads the papers, and, better than any one else, will be able to say whether my opinion is well founded. I think the editors do well, and considering the minimum support they receive from the Native public, it is a marvel how they contrive to exist at all. The style of writing varies (I am speaking of Urdu) with the subjects treated. Terseness is not a characteristic of Native expression. The spoken language is better than the written, for the vernacular is as yet rather a colloquial than a literary medium. It is worthy of record that a Native scholar of experience has recently suggested that the best selections in Urdu, according to current usage, for use in schools, would be a selection of articles from Native newspapers. I have already stated my opinion that the best test of English and vernacular scholarship for Native youth is ability to translate an ordinary article from the journals of the day. In practice I find the test severe, for the teachers unfortunately confine their own

and their pupils' attention to class books, without a thought of collateral and general information.

13. The second statement which is attached to this report, Statement A.1, of periodical publications, has the same number of entries this year as last. The *Hindoo Commentator*, which is a kind of rival of the Benares College *Pandit*, is now published in Calcutta, but 20 copies are still taken by this Government. The *Mazhar-ul-'Ulúm* was discontinued during the editor's absence in England. In the place of these magazines two others are entered, one of which is the *Gulshan-i-Riyází*, a school mathematical journal in Urdu, projected and supported by Mr. Boutflower, Professor in the Agra College. I think 100 copies of this will be very useful for circulation among tahsílí and town schools. The journal of the Debating Society of Meerut is not a new publication, but appears with sufficient regularity to be accounted one of the standing periodicals. It is always interesting, and 50 copies might be subscribed for for the use of the zillah schools, and best tahsílí schools in the Doab. The *Zakhíra-i-Bálgobind* is generally well stocked, but the editor is irregular in his time of publication. The sudden reduction of the subscription of Government from 175 to 60 copies was a trial, and I see that the number of Native subscribers has fallen from 107 to 36. Regular subscription to anything seems irksome to everybody in India. It is not that the journal has fallen off. The Native subscribers are willing to read it, but are unwilling to pay for it.

Nos. 3 and 4 on the list are translations into Urdu and Hindee from the Mahábhárat, and have been going on two or three years. The work seems to have a very limited circulation, and the editor wishes for aid from the Government. As a literary work, I think it deserves encouragement, and that a copy of the work so far as it has gone might be placed in each of the college libraries. The *Bareilly Review* is tolerably well sustained, and the editor is a good hand at translation.

The *Pandit* maintains its position with an increase of private patronage. Mr. Gough, Anglo-Sanskrit Professor in the Benares College, has recently reprinted part of his contributions to this serial in the form of a translation of the Vaiseshika Aphorisms of Kanáda.

2.—*From the* OFFICIATING SECRETARY TO GOVERNMENT, *North-Western Provinces, to the* DIRECTOR OF PUBLIC INSTRUCTION, *North-Western Provinces (No. 27).—Dated Allahabad, the 28th May*, 1873.

I AM directed to acknowledge the receipt of your letter No. 4532, dated the 25th March, 1873, being your report on the Vernacular Newspapers and Periodicals published in the North-Western Provinces during 1872.

2. The following tables show the statistics of the year of review as compared with that preceding :—

		1871.	1872.
Number of papers	...	30	36
Total in circulation	...	7,594	5,917
Average circulation	...	253	162
Number of Magazines	...	9	9
Total in circulation	...	1,935	1,408
Average circulation	...	215	156

3. Taking papers and magazines together, the total decrease in the number of issues has been 2,321; of which 2,225 are due to the decrease in Government patronage, and the remainder to decrease in the number of subscribers.

4. Of a total of 36 periodicals, 18, or one-half, are published in Agra, Allahabad, and Meerut; half of these, again, issue in the latter city alone, which publishes one-fourth of the whole number of periodicals in the Province. Of a total circulation of 5,917, 3,132, or 53 per cent., depend for support on Native subscribers, while the Government takes 1,613, or 27 per cent., chiefly for the use of schools, where they are of much use.

5. The largest number of subscribers belong to the *Allygurh Institute Gazette:* but the Bengali weekly *Prayág Dút* at Allahabad, and the Rampore weekly *Dabdaba-i-Sikandarí*, have the largest amount of native subscriptions. The ratio of native subscribers varies curiously. Thus, the Hindee fortnightly paper, the *Buddh Prakásh* has an issue of 105, 100 going to Government and 5 to natives; the *Akhbár-i-Núr-ul-Anwár* has 211 native subscribers out of 252 copies; the *Muhibb-i-Hind* is almost wholly supported by natives: one native only, on the other hand, subscribing to the *Jagat Samáchár*, a Hindee weekly paper of 87 copies, 80 of which are taken by Government.

6. The Magazines are similarly supported to the extent of one-half by Government; but these are mainly educational, and cannot be held to illustrate the spontaneous growth of an interest for such literature among the people.

7. Reviewing these results, I am to remark the decrease in the number of newspaper issues is to be regretted, though it appears to be mainly, if not altogether, due to the contraction of Government support. This, however, will have one good effect, if, as the Lieutenant-Governor hopes, it should lead the editors to see that they cannot lean altogether upon Government; but that, while Government may afford countenance and a certain degree of aid by taking copies for circulation among educational institutions, the managers must look mainly for success to the number of private subscribers.

8 I am to thank you for your highly interesting account of the various papers, and for the illustrations given by you of the manner in which subjects are treated in them. The estimate formed by you of the character of the Press generally appears to His Honor to be correct. The tenor of the articles, though ordinarily wanting in originality and vigour, is, upon the whole, good. The treatment of the political subjects

has been, as a rule, fair and loyal. The absence of anything of an injurious or improper nature is to be commended, and the circulation of intelligent discussions based upon fact, and taking a tolerably wide political and social scope, cannot but have a wholesome effect upon the people. It is to be regretted that the circulation is still so limited, but taste for such reading will grow, though gradually; and, once formed, the habit will hold its ground: and, as interest increases, the tone of the periodical press will by degrees correspond to the more enlightened requirements of readers. Upon the whole, the results now reported continue to be encouraging.

Statement A. regarding the Periodical Publications issued from the

Number.	District.	Town in which issued.	Name of Press	Name of Publication.	Name of the Proprietor of the Press.
1	Agra ...	Agra ...	Núr-ul-Ilm Press.	Ábi-Ḥayat-i-Hind...	Pundit Bunsí Dhur.
2	Ditto ...	Ditto ...	Educational Press	Agra Akhbár ...	Khwaja Yúsuf Alí...
3	Ditto ...	Ditto ...	Iláhí Press ...	Khurshíd Jahántáb.	Muchchhoo Khán ...
4	Ditto ...	Ditto ...	Mufí'd Ám Press.	Mufí'd Ám Akhbár.	Ahmed Khán Súfí
5	Ditto ...	Ditto ...	Urdú Delhi Gazette Press.	Urdú Delhi Gazette	Proprietor Delhi Gazette Press.
6	Allahabad.	Allahabad.	Núr-ul-Absár Press ...	Núr-ul Absár ...	Moonshee Sadá Sukh Lál.
7	Ditto ...	Ditto ...	Ditto ...	Buddh Prakásh ...	Ditto ...
8	Ditto ...	Ditto ...	Bengálí Press ...	Prayág Dút ...	Shib Krishna Chuckerbutty.
9	Ditto ...	Ditto ...	Núr-ul-Absár Press ...	Áínah-i-Ilm ...	Moonshee Sadá Sukh Lál.
10	Allygurh	Allygurh .	Institute Press...	Aligurh Institute Gazette.	Scientific Society.
11	Ditto ...	Ditto ...	Ditto ...	Tahzíb-ul-Akhláq...	Ditto ...
12	Ditto ...	Beswan ...	Vyághra Pad Prakashka.	Mangal Samáchár.	Thakur Gir Prasád Singh.
13	Almorah...	Almorah	Debating Club Press.	Almorah Akhbár...	Members of the Society.
14	Benares ...	Benares ...	Benares Akhbár Press.	Benares Akhbár ...	Gobind Ragho Náth
15	Ditto ...	Ditto ...	Medical Hall Press.	Kavi Vachan Sudhá	E. J. Lazarus & Co.
16	Bijnour ...	Bijnour ...	Zain-ul-Matábí, ...	Akhbár-i-Naiyer-i-Akbar.	Zain-ul-'Ábidín ...
17	Cawnpore	Cawnpore	Nizámí Press ...	Akhbár-i-Nur-ul-Anwar,	Mahomed Abdur Rahmán Khán.
18	Ditto ...	Ditto ...	Shola-i-Túr Press	Akhbár-i-Sho'la-i-Túr.	Moonshee Jumna Pershád
19	Ditto ...	Ditto ...	Matlaí Nur ditto.	Akhbár Matl'ai Núr.	Behary Lál ...
20	Jounpore	Jounpore .	Isháqí Press.	Nasím-i Jounpore...	Mahomed Isháq ...
21	Meerut ...	Meerut ...	MuhibbiHindPress	Lawrence Gazette.	Syed Jamil'-ud-dín.
22	Ditto ...	Ditto ...	Ditto ...	Muhibb-i-Hind ...	Ditto ...
23	Ditto ...	Ditto ...	Ditto ...	Nagrí Prakásh ...	Ditto ...
24	Ditto ...	Ditto ...	Dár-ul-ulúm Press	Akhbár Álam ...	Vajáhut Alí Khán.
25	Ditto ...	Ditto ...	Ditto ...	Jagat Samáchár ...	Ditto ...
26	Ditto ...	Ditto ...	Ditto ...	Meerut Gazette ...	Ditto ...
27	Ditto ...	Ditto ...	Sultán-ul-Matábí,	Jalwa-i-Túr ...	Lálá Ganeshí Lál...
28	Ditto ...	Ditto ...	Ditto ...	Muir Gazette ...	Ditto ...
29	Ditto ...	Ditto ...	Ziyáí Press ...	Najm-ul-Akhbár ...	Moonshee Fazl Hosein, Qazí Amír-ud-dín, Moonshee Najm-ud-dín.
30	Moradabad	Moradabad	Khurshíd-i-Hind Press.	Rohilkhund Akhbár.	Bishen Saroop ...
31	Ditto ...	Ditto ...	Ditto ...	Rohilkhund Samáchár,	Ditto ...
32	Ditto ...	Ditto ...	Riyaz-i-Núr Pres	Lauh-i-Mahfúz ...	Mehdí Hossein Khán
33	Ditto ...	Rampore	Husúnee Press ...	Dabdaba-i-Sikandarí.	Mahomed Husun Khán.
34	Nynee Tal.	Nynee Tal,	Samay Vinod Press.	Samay Vinod ...	Pundit Jaidut Joshí
35	Shahjehanpore ...	Shahjehanpore.	Mahomdí Press...	Saunders' Gazette	Mahomed Asghar Alí,
36	Ditto ...	Ditto ...	Gaurí Press ...	Rifáh-i-Khaláiq ...	Moonshee Byj Náth

Native Presses in the North-Western Provinces during the year 1872.

Name of the Editor.	Date of Publication.	Taken by Government.	By European subscribers.	By Native subscribers.	Exchanged with other Presses.	Total.	Remarks.
Pundit Bunsí Dhur,	Fortnightly ...	80	30	130	25	265	Urdú and Hindí.
Khwajá Yúsuf Alí	Every tenth day	80	150	25	51	306	Urdú
Alí Ahmed ...	Fortnightly ...	20	8	50	22	100	Ditto.
Ahmed Khán Súfí...	Ditto ...	50	15	165	18	218	Ditto.
Mr. W. Deago ...	Weekly ...	50	29	71	5	155	Ditto.
Moonshee Sadá Sukh Lál.	Fortnightly ...	100	2	18	24	144	Ditto.
Ditto ...	Ditto ...	100	...	5	...	105	Hindí.
Modoo Soodun Mitra	Weekly ...	...	...	225	20	245	Bengálí.
Moonshee Sadá Sukh Lál.	Monthly ...	100	...	38	4	142	Urdú.
Mahomed Ismáel ...	Weekly ...	100	38	191	52	381	Ditto.
Syed Ahmed Khán, C.S.I.	Fortnightly ...	2	4	124	5	135	Ditto.
Pundit Dwárká Náth	Monthly ...	100	23	113	7	243	Hindí.
Lálá Nund Joshí ...	Fortnightly ...	31	36	116	22	205	Urdú and Hindí.
Gobind Ragho Náth	Weekly ...	41	3	46	30	120	Hindí.
Gadádhar Singh, ...	Fortnightly ...	100	5	150	10	265	Ditto.
Mahomed Hossein,	Weekly ...	20	40	30	20	110	Urdú.
Mahomed Yáqúb ...	Ditto ...	20	...	211	21	252	Ditto.
Mirzá Ibráhím Beg,	Ditto ...	51	8	150	25	233	Ditto.
Rám Bukhsh ...	Ditto ...	21	...	20	10	51	Ditto.
Mahomed Isháq ...	Ditto ...	22	1	34	18	75	Ditto.
Syed Jamíl-ud-dín,	Weekly ...	50	15	200	40	305	Urdú.
Ditto ...	Ditto ...	...	3	97	...	100	Ditto.
Ditto ...	Ditto ...	...	3	22	...	25	Hindí.
Vajáhut Alí Khán...	Ditto ...	75	8	70	37	180	Urdú.
Ditto ...	Ditto ...	80	1	1	5	87	Hindí.
Ditto ...	Ditto ...	20	...	40	2	62	Urdú.
Lálá Ganeshí Lál...	Ditto ...	22	21	111	26	180	Ditto.
Ditto ...	Ditto ...	22	25	101	21	169	Ditto.
Proprietors ...	Ditto ...	50	7	81	25	163	Ditto.
Ziyá-ud-deen ...	Ditto ...	53	11	103	24	191	Ditto.
Ditto	Ditto ...	83	...	28	3	114	Hindí.
Mehdí Hossein Khán	Ditto ...	...	12	66	23	101	Urdú.
Mahomed Husun Khán.	Ditto ...	21	15	247	33	316	Ditto.
Pundit Jaidut Joshí,	Fortnightly ...	30	5	24	15	74	Hindí.
Mahomed Asghar Alí	Weekly ...	...	7	29	4	40	Urdú.
Moonshee Byj Náth	Bi-monthly ...	20	...	...	...	20	Urdú (full return not received.)
		1,613	525	3,132	647	5,917	

Revised Statement AI. regarding the Periodical Publications issued from the Native Presses in the North-Western Provinces during the year 1872.

Number.	District.	Town in which issued.	Name of Press.	Name of Publication.	Name of Proprietor of the Press.	Name of Editor.	Date of Publication.	Taken by Government.	By European subscribers.	By Native subscribers.	Exchanged with other Presses.	Total.	Remarks.
1	Agra ...	Agra ...	Urdú Akhbár Press	Zakhíra-i Bálgobind	Munshí Bálgobind...	Munshí Bálgobind ...	Mthy.	60	3	36	1	100	
2	Ditto ...	Ditto ...	Medical ditto ...	A'ínah-i-Tabábat ...	„ Imám-ud-dín	„ Imám-ud-dín,	Do.	135	6	159	1	301	
3	Ditto ...	Ditto ...	Sattya Prakásh ...	Makhzan-i-Mahábhárat, Urdú.	Jwálá Prasád Bhargo,	Jwálá Prasád Bhargo,	Do.	37	...	55	...	92	
4	Ditto ...	Ditto ...	Ditto ...	Ditto, Hindí ...	Ditto ...	Ditto ...	Do.	10	1	49	...	60	
5	Ditto ...	Ditto ...	Educational Press	Gulshan-i Riyází ...	Amír-ud-dín and Yúsuf Alí.	Amír-ud-dín and Yúsuf Alí.	Do.	...	5	139	10	154	
6	Meerut	Meerut	Muhibb Kishwar-i-Hind	Journal of Debating Society.	Members of Debating Society.	L. Jeremy ...	Do.	...	9	95	13	117	
7	Bareilly	Bareilly	Rohilkhund Literary Society Press	Bareilly Review ...	Society ...	Munshí Ajodhia Prasád.	Do.	200	...	5	8	213	
8	Moradabad.	Moradabad	Association Press...	Gunjína-i-Ulúm ...	British Indian Association.	Munshí Gungá Prasád.	Do.	150	11	78	17	256	
9	Benares	Benares	Medical Hall Press	The Pandit ...	Dr. Lazarus ...	R. Griffith, Esq. ...	Do.	20	38	50	7	115	
							Total	612	73	666	57	1408	

OFFICE OF DIRECTOR OF PUBLIC INSTRUCTION,
NORTH-WESTERN PROVINCES:
Dated Allahabad, the 28th March, 1873.

M. KEMPSON,
Director of Public Instruction, N.-W. P.

Art. XXVI.

RESULT OF THE MEASURES TAKEN FOR THE RELIEF OF THE INHABITANTS OF JOUNPORE. *

1.—*From*—THE VICE-PRESIDENT AND THE SECRETARY, *Jounpore Floods Relief Committee, to* THE COMMISSIONER OF ALLAHABAD DIVISION.—*Dated Jounpore, the 30th April,* 1873.

WE have the honour to submit, for the information of Government and of the subscribers to the Jounpore Floods Relief Fund, a report of the manner in which these contributions were applied to relieve the sufferings caused by that great calamity.

The Flood.

2. How the river Goomtee, swollen by unprecedented rains which fell on the 13th and 14th September in Eastern Oudh, rose suddenly on the 15th September, and continued to rise until the 28th; how the whole of the city of Jounpore south of the Goomtee, and a great part of the city on the north bank, were overwhelmed in the waters,—has become matter of history.

3. The incidents which attended the destruction of the city were described in the public prints and official accounts by resident eye-witnesses. The scene of desolation, which it presented during and after the subsidence of the floods, was portrayed by still abler writers who visited it during that period.

Mr. Mayne organises a Committee.

4. On the 4th of October, 1871, the late Mr. F. O. Mayne, Commissioner of Allahabad, visited Jounpore while the waters were still subsiding, held a meeting of the residents, and organized a

*For an account of the flood at Jounpore see Vol. VI., No. II., page 175.

committee to raise subscriptions and to administer relief to persons reduced to distress by the floods.

Government advances Rs. 10,000 for general purposes.

5. The Government of the North-Western Provinces indicated its sympathy by placing Rs. 10,000 at the disposal of the Magistrate and Committee.

6. The expenditure of this sum, the clearing of streets barricaded by ruins of fallen houses, the removal of silt and decaying matter, and collection of timber and other floated material, belonged to the official members of the committee in their official capacity.

7. The special work of the committee was to provide present personal relief, in the shape of food and shelter, to persons who had lost their houses, stores, and means of livelihood, and to receive applications for aid to rebuild.

The Lieutenant-Governor's visit.

8. On the 17th November, His Honor the Lieutenant-Governor of the North-Western Provinces, with the Chief Engineer and the Secretary to Government, visited the ruined city, presided at a meeting of the inhabitants, who, ignorant of the causes of the flood and of the chances of another soon recurring, anxiously awaited the counsel or command of Government on the question of rebuilding on their former sites. After hearing the opinions and wishes of the inhabitants, His Honor decided that they should be allowed to rebuild on their former sites.

He decides the former sites might be occupied.

His letter No. 1860A.

Promises aid to rebuild under some positive restrictions.

9. In his letter of 24th November, he promised on the part of Government aid to rebuild their homes to the extent, if need be, of twice the sum that should be raised by private subscriptions; but laid down certain restrictions under which it should be expended, and especially imposed on the Magistrate the responsibility that no more be spent under this head than absolutely necessary.

These restrictions were—

1.—The absolute need of the applicant.

2.—The fitness of the proposed site with reference to the probability of destruction by new floods.

3.—That the grant should not ordinarily exceed a third of the cost of an earth-walled building usually inhabited by persons of the labouring class.

Work of committee in investigating claims and distributing aid to rebuild.

10. The petitions for aid to rebuild received by the committee were referred for investigation and report to Native members of the committee, and on receipt of their reports, magisterial or judicial officers visited each site in person, and confirmed or modified the proposed award. The money was paid by instalments, and a second instalment not paid until it had been ascertained that the first had been well expended. In the few cases where persons who had received money showed indisposition to build, the instalments were promptly recovered from them. Great fairness and judgment was shown by the Native gentlemen who examined claims and proposed awards, and officials were vigilant in checking these lists from house to house, and ascertaining that grants were in each case properly expended.

Work interrupted by rain in December, 1871.

Distribution of blankets.

11. The work of rebuilding was interrupted by unusually heavy rains in December, 1871, and January, 1872. The people, whose mud walls were half raised and roofs not commenced, suffered severely from wet and cold: *razáis* and blankets were imported and distributed, and at the same time a small quantity of food was distributed by recommendation of the Civil Surgeon.

Dr. W. Walker recommended delay;

12. At this time a high medical authority who visited Jounpore expressed an opinion that the rebuilding was taking place too soon, before the ground was healthily dry; at the same time the committee was broken up by the transfer or departure of many of its members.

and work of rebuilding resumed in March, 1872;

13. The task of distributing aid to rebuild was resumed in March, 1872, and pushed forward rapidly until the rains.

finished in cold season of 1872-73.

14. In the cold season of 1872-73 aid was extended chiefly to such owners of shops who were found unable to rebuild without aid, and were still exposed to the inclemency of the weather.

15. The extent of the relief afforded under the head of aid to rebuild may be thus stated:—A comparison of the census of 1865 with that of January, 1872, and an enumeration made on the subsidence of the floods. Each gave the same result of about 4,000 houses destroyed; of these houses many were unoccupied before the floods, some were the property of men of means who have rebuilt without aid, some belonged to persons who owned several houses, and have received aid to build one only, and some of the owners have never returned.

Number of houses destroyed.

In the city and suburbs of Jounpore 1,971 houses, and in Zuffrabad 329 houses, have been rebuilt by the aid of the committee, at an average cost of Rs. 12-8-0 in Jounpore, and Rs. 7 in Zuffrabad. The average grant in the latter case was smaller, because a large proportion of the inhabitants belonged to classes who worked with their own hands on the rebuilding of their houses; they were also helped with roofing materials.

Number of houses rebuilt.

16. The result may be seen by visiting the great hamlets, like Meanpore, which, with the two leading thoroughfares, compose a great part of Jounpore.

17. A more showy result might have been obtained by departing from any one of the restrictions imposed by Government, or by obtaining a modification of the permission to build on the old sites; but by a scrupulous adherence to the instructions of Government, the maximum of relief has been afforded with a minimum of expenditure.

Result.

18. This report should not close without the remark that the anxiety shown by Government to aid the people in their distress, the liberality of subscribers, and the labours of Government officers to utilize the relief thus afforded, have had an excellent effect on the Mahomedan population, who were formerly thought sullen and disaffected: their changed attitude is much remarked by European visitors who have known Jounpore in past times and now.

Moral effect on the people of Jounpore.

19. The following is the balance sheet of receipts and expenditure:—

Balance of receipts and expenditure.

Abstract of Receipts.	Rs. a. p.	*Abstract of Expenditure.*				Rs. a. p.
Government advance, ..	10,000 0 0	Restoring communications, removing fallen houses, clearing sites, detailed in letter of 11th June, 1872, ...	₹			5,279 7 8
Private subscriptions, ...	14,769 13 6	Transferred to Magistrate of District for same purpose, ...				4,720 8 4
Drawn from Government for aid to build, ...	28,667 10 0	Total, ...				10,000 0 0
Balance from Orissa Famine Fund, ...	26 4 4	Food and medicines, ...	763	2	9	
Sale of Materials, ...	152 12 3	Blankets, razais, and mats, ...	3,039	1	8	
Refunds carried to credit, ...	801 15 0	Roofing materials, ...	1,306	8	9	
		Aid to rebuild in Jounpore, ...	24,915	5	0	
		Ditto in Zuffrabad, ...	2,418	3	6	
		Establishment, ...	93	11	0	
		Miscellaneous expenses, ...	100	8	5	32,636 9 1
		Total, ...				42,633 9 1
		Balance, ...				11,781 14 0
Total, ...	54,418 7 1	GRAND TOTAL, ...				54,418 7 1

There is, therefore, a balance of Rs. 11,781-14-0, which represents the extent to which it has been found unnecessary to draw upon the resources of the Government.

It is for the present Magistrate of Jounpore to make proposals as to the manner in which it should be treated.

2.—*From* C. A. ELLIOTT, ESQ., *Secretary to Government, North-Western Provinces, to* G. H. M. RICKETTS, ESQ., *Commissioner of Allahabad, (No.* 1247*A*).—*Dated Nynee Tal, the* 14*th June*, 1873.

I AM directed to acknowledge your docket No. 123, dated 10th May, with which you submit a joint report by the Vice-President and Secretary of the Jounpore Floods Relief Committee on the results of the measures adopted for the relief of the inhabitants of Jounpore.

2. His Honor the Lieutenant-Governor considers the report, which will be published in the North-Western Provinces Gazette and in the Selections from the Records of Government, to be highly satisfactory.

3. About four thousand houses were destroyed by the floods of 1871. Of these, 1,971 in Jounpore and 329 in Zuffrabad were rebuilt with the aid of the committee.

4. The private subscriptions for the relief of the inhabitants amounted to Rs. 14,769, the Government granting a sum of Rs. 28,667. Of this grant only Rs. 16,886 have been expended in the actual restoration of houses. But a sum considerably exceeding this balance has been sanctioned by the Lieutenant-Governor for the provision of a broad approach from the bridge road to the railway station, with sites for building on either side, as well as for a market and dispensary, and a large amount has been contributed by Government for the restoration of the dispensary and school.

5. His Honor has read with much gratification the remarks contained in the 18th para., as to the change worked in the attitude and temper of the residents of Jounpore by their grateful appreciation of the efforts of the Government on their behalf.

Art. XXVII.

PUBLICATIONS REGISTERED BY THE CURATOR OF GOVERNMENT BOOKS UNDER ACT XXV. OF 1867 DURING 1872.

1.—*From* M. KEMPSON, ESQ., *Director of Public Instruction, North-Western Provinces, to* C. A. ELLIOTT, ESQ., *Secretary to Government, North-Western Provinces (No* 4507). —*Dated Allahabad, the* 21*st March*, 1873.

I HAVE the honour to submit, for His Honor's information, the catalogue of publications registered by the Curator of Government Books under Act XXV. of 1867 during the year 1872, with the following remarks:—

2. The number of entries is shown in the margin, with last year's figures by way of contrast. The decrease appears to be due in a great measure to the ruling of the Resolution of the Government of India No. 5605, dated 21st December, 1871, of the probable effect of which I spoke in paragraph 2 of my report for that year. His Honor's orders No. 1263A., dated 11th April, 1872, on this subject (see paragraph 11) made it clear that reprints were to be received as usual, and were communicated without delay (my letter No. 177, dated 13th April, 1872, of which a copy is submitted for reference); but this class of publication was withheld by the District Officers, and when sent, returned by the Curator up to September, 1872, when the Resolution of the Government of the North-Western Provinces, No. 3061, dated 12th September, 1872, which revoked the order about reprints, was

	1871.	1872.
Books, ...	317	97
Pamphlets, ...	243	77
Periodicals, ...	120	56
Miscellaneous, ...	20	6
Total, ...	700	236

received. In reply to my demi-official question on this subject, Captain Dodd writes:—

"I cannot tell you exactly how far the 1872 catalogue has suffered by the return of reprints: because the District Officers ceased to send reprints as soon as the Resolution of the Government of India was published. A few magistrates, however, continued to send them to me, and in this way I had to return 374 between January and September, 1872, 363 of which went back to Cawnpore alone on 2nd April, 1872. These 374 were returned because they, or their earlier editions, had already been registered before, and published in previous catalogues."

It would have been better, perhaps, if the Curator had issued a Circular to the registering officers on receipt of my letter in April, which would at any rate have arrested the effect produced by the publication of the first Resolution of the Government of India. It seems impossible now to say what books have been returned to the publishers by the receiving officers.

3. As regards the books, the 97 publications under this head consist of editions of 130,080 copies in all—that is, an average of 1,330 copies of each work. Twenty-nine presses at twelve towns have produced these publications, and the marginal table shows the distribution of the books published at Allahabad. Ten of 40,500 copies belong to the Government Press, and those published at Roorkee to the College Press. It follows that two Government Presses alone have produced 17½ per cent. of the books and 37½ per cent. of the copies. Moreover, all

Towns.	No. of Books.	Copies.
Allahabad, ...	21	60,000
Agra, ...	21	12,750
Cawnpore, ...	13	17,500
Meerut, ...	13	9,130
Benares, ...	7	10,300
Roorkee, ...	7	9,000
Bareilly, ...	5	3,250
Shahjehanpore, ...	4	4,500
Furruckabad, ...	3	2,200
Allygurh, ...	1	1,000
Lullutpore, ...	1	250
Almorah, ...	1	200
	97	130,080

these issues are educational. It is obvious that, so far as the Registration Act is an interpreter, these results indicate a dearth of literary enterprise. On the other hand, educational works are in great demand, and private presses are beginning to reprint our books. It is, perhaps, possible to see here the effect of education in improved taste so far as a lessening demand for trash is an index. One could wish to see, at the same time, a worthier literature coming up. Towards such a result His Honor's Prize Notification has been, and is, a hopeful agent. If the registration under the Act were complete—that is to say, if all publications worthy of the name of books were registered, old or new—no better gauge of the result of education, or of the change in popular feeling and thought, could be devised. I am of opinion that the publishers need to have their attention called to the Act by magisterial interference. The Native presses of Agra, Cawnpore, and Meerut especially may be held to have avoided a thorough registration of the publishing business. There are ten or more presses in Agra, and about the same number in Meerut. The best type-work, taking all things together, is that of the Roorkee College Press, and the best lithograph work is still that of the Nizami Press of Cawnpore. I regret to see the Aligurh Scientific Society's Press idle, especially as it has hitherto drawn a subsidy from the Government.

4. Next as regards the subjects and languages of the books registered, I give below a rather more detailed schedule of figures than that of last year. The subjects are the same, except that I have separated History from Educational, and that "Professional" has been subdivided. The number of copies has also been given in detail.

Subjects.	*Urdu.*		*Hindi.*		*Arabic.*		*Persian.*		*Sanskrit.*		*English.*		*Bi-lingual.*		TOTAL.	
	No. of books.	Copies.	No. of books.	Copies.	No. of books.	Copies.	No. of books.	Copies.	No. of books.	Copies.	No. of books.	Copies.	No. of books.	Copies.	No. of books.	Copies.
Religious, ...	7	10,800	2	1,250	1	1,000	...	...	3	1,400	...	...	1	1,850	14	16,300
Educati o n a l and Moral,	11	19,500	16	41,650	2	950	3	4,000	...	...	1	550	2	9,000	35	75,650
History, ...	4	3,000	...	...	...	...	...	..	...	...	...	...	13	5,750	17	8,750
Professional. Medicine,	2	3,000	...	...	...	...	...	...	...	...	...	...	...	...	2	3,000
Professional. Law, ...	2	1,500	...	...	...	...	...	...	...	...	1	500	...	...	3	2,000
Professional. Engineering, ...	1	1,000	..	...	...	...	...	...	...	...	4	5,500	...	...	5	6,500
Professional. Military,	...	...	...	...	...	...	...	...	...	...	1	30	1	500	2	530
Poetry, ..	3	2,100	1	500	...	...	3	2,500	...	...	1	800	..	...	8	5,900
Miscellaneous,	4	5,000	3	3,300	...	....	2	2,000	...	...	2	1,150	...	..	11	11,450
Total, ...	34	45,900	22	46,700	3	1,950	8	8,500	3	1,400	10	8,530	17	17,100	97	130,080
Total in 1871,	88	119,435	48	115,804	52	67,075	50	65,025	4	4,100	34	49,480	35	19,900	317	440,819

5. The most remarkable feature in this, as a comparative statement, is the large decrease in the number of publications registered. This number is one-third what it was in 1871, and half what it was in 1870. The diminution seems worthy of analysis by numerical representation as given in the margin, from whence it appears that the largest relative falling off has been in Arabic, Persian, and Sanskrit works, notably in the two former. It is remarkable that the number of copies of Arabic and Persian books published in 1872 is only 8 per cent. of the whole issue, whereas it was 30 per cent. in 1871. Nor is this decrease explicable on the ground that what were called "books" last year may have been relegated to the division "pamphlets:" thus, I find that the number of Arabic and Persian pamphlets is between 6 and 7 per cent. only of the whole number. How is this to be explained? Partly because Arabic and Persian books are generally reprints, and may have been returned to the publishers by the

	Rates of decrease.
Urdu books, ...	2·6
Hindi, ...	2·2
Oriental (classical), ...	8·0
English, ...	3·4
Bi-lingual, ...	2·0

registering officers, and partly because the supply of Arabic and Persian editions last year was in excess of the demand for one year. Editions are not always of the same size, and are exhausted at unequal intervals. The inference drawn in 1871 that the larger number of Arabic and Persian publications pointed to increased mental activity among the Mahomedans is not therefore negatived by the smaller registration in 1872. Nevertheless, if the proportion of the Mahomedan population is 14 per cent., we might expect an approximation to this proportion in the books provided for their study or entertainment. The proportion should, in fact, be rather larger, because a large section of educated Hindoos read Persian.

6. The largest number of copies of books under any one language belongs to Hindi, *viz.*, 46,700 copies—a rather larger number than the figures for Urdu; but if pamphlets are counted also, the Urdu publications considerably out-number the Hindi. There are, in fact, 68 Urdu publications of 70,350 copies against 33 Hindi, with 65,275 copies.

7. The detail of subjects in the statement of paragraph 3 shows that the number of copies of education books is about 58½ per cent. of the whole, which varies little from last year's calculations. This proportion is one per cent. less if the pamphlets are reckoned. Religious books stand at 12½ per cent. of the whole; but if the religious pamphlets are added, the ratio rises to nearly 20 per cent., which was last year's figure for the "books" alone. The general constancy of these proportions after some years of observation indicates the practical and serious bent of those Natives who use books at all. There seem to be very few Natives in this part of India who read for pleasure. An English railway station has its book-stall, if it has anything; but the Native traveller in India wants water and sweetmeats only. If it is true that the appetite of a nation grows by what it feeds on, the prospect is unsatisfactory. There is, however, some comfort in the reflection that a feeble demand for literature, other than educational and religious, includes a limited demand for books of immoral tendency. If

this is really declining, and the registrations of the catalogue are reliable, a re-action is sure to follow in an increased demand for a superior class of books, for it is an undoubted fact that the number of those who can read swells annually. It would be guess work to estimate the existing number of books readable by average Natives in the North-Western Provinces. It has been said that, taking the aggregate of the public libraries of the entire world, there is now one volume for every 60 persons, and that another century will see as many volumes in hand as there are inhabitants of the globe. There are about 2,000,000 books in the public libraries alone of Great Britain. If the catalogues now published under the Indian Act are a safe guide, it will be centuries before the contents of libraries and book-shops together in the North-Western Provinces approach this total.

8. I have extracted the figures of the subjoined statement of books, &c., published in Great Britain during the year 1870 from the "Publishers' Circular," arranging them as far as I can so as to correspond with the statement of subjects in paragraph 3 above. From this it appears that the religious or theological element is represented by about 16 per cent. of the books considered, irrespectively of the number of copies of each, which I have no means of ascertaining, and that the Educational and Juvenile works are between 24 and 25 per cent. Considerably more than half the books are works of general interest, and show a great demand for mental recreation.

Subjects.		No. of books.
Religious	...	811
Educational and Juvenile,		1,263
History, Biography, Travels	...	734
Professional. Medicine	...	193
Professional. Law	...	123
Professional. Science.	...	346
Professional. Trade	...	119
Poetry	...	366
Fiction	...	381
Pamphlets and Miscellaneous.		746
Total	...	5,082

I may add that of the 5,082 books 3,374 are new, 426 are importations from the United States, and the rest reprints.

9. Reverting to the statement of paragraph 3, I proceed to notice briefly a few books which appear worthy of regard.

Religious Works.—The books registered under this head are 14 in number, with 16,300 copies. Three of the Urdu works are in the Roman character, and are commentaries on portions of the New Testament published by the Tract Societies in Allahabad.

The Arabic work under this head is a commentary on the *Waqaya*, by Obiedullah, published at Cawnpore.

The work entered in the column of bi-lingual publications is a fine copy of the Koran, with a Persian and Urdu version, published at Hushim Ali's Press, Meerut, which is well known for the niceness of its editions of the Koran, at the price of four rupees a copy.

Educational Works.—No. 5 on the catalogue is an Arabic Grammar in Urdu by the learned Deputy Collector of Cawnpore, Mir Imdad Ali. I had asked him to draw up a grammar suitable for schools and based on the current treatises. His work is somewhat too lengthy and ponderous for the purpose, but I consider it an improvement on the ordinary series of *Mizan Munshaib*, &c. The purchase of copies by the Government will be recommended as an acknowledgment of the literary skill displayed by the compiler.

No. 87 is a good selection from the Gulistan, Bostan, &c., drawn up by one of the oriental teachers in the Benares College for use in Government schools. It is much to be wished that works of this kind were more generally adopted in mission and private schools. The moulvies in charge of the oriental teaching in the former class of school seem to me to have their own way too much, and the consequence is that Sadi and other authors are read from the complete editions sold in the bazaars. Expurgated editions should be used, and I am glad to know that Mr. John Murdoch, of Madras, has written strongly on the subject in one of his many interesting *brochures* on education in this country.

The Reverend A. F. R. Hœrnle's "Analysis of Reid's Inquiry into the Human Mind" (No. 133 in the catalogue) merits the attention of educationists. Reading and thought of a high order characterize his Analysis.

Moulvie Nazir Ahmad's Select Tales in Urdu (No. 148) are beautifully written. This little work was noticed by me at greater length some time ago, when I reviewed a series of books sent up by the author under His Honor's Prize Notification. Mr. Stapley's Series of Graduated Exercises (No. 220) has been also noticed before. It has met with a favourable reception beyond the limits of the North-Western Provinces, and in the hands of good teachers is a powerful help to the acquisition of idiomatic English by Native students. Natural Philosophy in Urdú (No. 221), by Ruder Sehai, District Engineer of Etawah, has been rewarded under the Prize Notification. It is not, however, an original work.

I should observe here that educational works include moral treatises; and this brings me to a work of merit in Hindi (No. 16), the *Nitisudha Tarangini*, by Ram Pershad Tiwari, an employé in the Government Translator's office. He has received a reward under the Prize Notification for this book, and it has been printed by the Government.

The Arabic and Persian educational works entered in the catalogue are of no importance.

Works on History.—Those in Urdu are translations of Arabic works on the victories of the Prophet. Those entered as bi-lingual are serial parts of a translation of the Mahabhárat in Urdu and Hindi with the original text, which have been issuing for some time past from Jwala Pershad Bahargawa's Press at Agra (Satya Prakash Press). The author has recently asked for the introduction of his work into the course of reading in vernacular schools, but it is hardly suited for the purpose. The Urdu version is inferior to the Hindi, as might be expected. The only work issued by the Scientific Society's Press (Aligurh) is an Urdu translation of Malcolm's

History of Persia, Part I. The work is worth translation, and, so far, the rendering is not amiss.

Professional Works.—The best of these are the practical series of class-books in engineering, surveying, &c., published at the Roorkee College. These are very well and carefully brought out by the Manager of the College Press, Mr. Johnston. If the staff was sufficient, I should like to have all mathematical school-books printed here rather than at Allahabad; also books in which figures and illustrations occur.

Of the medical works registered in the catalogue, Nos. 9 and 32, the one is by a Native hakeem, and the other by a Native doctor. It is a pity a compound of these often severally useful agents cannot be formed. The one wants real knowledge in place of his empiricism, and the other wants sympathy with Native practice, and especially, it appears to me, knowledge of the terms in vogue. Imam-ud-din's "Practical Surgery" (No. 32) should be a useful work, and he deserves credit for bringing it out. It could be wished, however, that fewer English terms were used, and that the drawing was more graphic. The surgical illustrations are more repulsive than they need be, and there is no reason why the skill which is brought to bear upon the delineation of scientific instruments by the Roorkee Press for instance should not be exercised in behalf of a far more important branch of learning than levelling and surveying. A copy of the work under notice should be placed in all dispensaries, so that Native doctors in charge might compare and record their own experience and practice. A copy should also be available at Railway Stations, where medical attendance in emergencies is not to be had.

The military works are merely versions of drill and outpost instructions for the use of officers.

Poetry.—The work registered under this head in English is the third volume of Mr. Griffith's interesting version of Valmiki's Ramayan. It has been fairly printed at Mr. Lazarus' Press, Benares.

In Urdu verse, I notice a good edition of Nadir's odes by Mirza Kab Hossein, of Futtehgurh (No. 53); a "Diwan," by a Native lady, republished (No. 115), and another specimen by Mr. G. Pesh, of Meerut (No. 124). I have met with only one other example of Urdu verse by a non-Native author. Judged by the European or classical standard of poetical excellence, these compositions rank low. From a Native point of view they are of average merit.

Miscellaneous.—Among these I do not find anything of importance. There is a tract on Electro plating by Anwar Ali, and another on Photography, both published at Meerut. No. 26 on the catalogue is an Urdu verse version of Sadi's Bostan, which I have reviewed under the Prize Notification. The English works under this head are Mr. Keene's Agra Guide and Mahomed Syud Ahmad's Review of Dr. Hunter's "Our Indian Musalmans." Both should have been classed as pamphlets.

10. Mr. Lyall's note on the catalogue of last year points out what is true in some measure, *viz.*, that the division of publications into books and pamphlets is inconvenient, because undue weight is attached to the books. I therefore supply a statement corresponding to that for books in paragraph 3 above :—

Subjects.	*Urdu.*		*Hindi.*		*Arabic.*		*Persian.*		*Sanskrit.*		*English.*		*Bi-lingual.*		*Total*	
	No. of books.	Copies.	No. of books.	Copies.	No. of books.	Copies.	No. of books.	Copies.	No. of books.	Copies.	No. of books.	Copies.	No. of books.	Copies.	No. of books.	Copies.
Religious, ...	15	12,150	4	6,700	1	2,000	...	..	4	2,175	5	1,000	3	1,600	32	25,025
Educational and Moral, ...	9	8,275	6	10,875	...	...	3	3,600	3	1,800	3	10,000	4	10,500	28	44,450
Medical, ...	1	1,000	1	1,000	...	...	...	...	...	...	...	...	...	...	2	2,000
Poetry, ...	4	1,900	...	...	...	...	...	...	...	...	...	...	...	...	4	1,900
Miscellaneous, ...	5	2,125	..	..	...	...	...	...	2	700	3	2,100	1	350	11	5,275
Total, ...	34	25,450	11	18,575	1	2,000	3	3,600	9	4,675	11	13,100	8	11,850	77	78,650

11. I find nothing noteworthy among the religious pamphlets, except a little Hindi tract (No. 47) called *Mukti Muk-*

tawali, by J. Christian, printed by Mr. Jordan, Allahabad, for the American Tract Society. The diction of this is good.

The number of educational works and copies is large comparatively on account of the inclusion of the Government editions of Primers and other elementary school-books. I observe that these works are now reprinted in large numbers at private presses. They are cheaper than the Government editions, though inferior, and are much in demand in consequence. We shall find this tell upon our book sales, but I cannot compel the boys to take one edition in preference to another. The question is,—have these presses a right to reprint our school series without permission? Under "Medical," the two tracts on vaccination by Lalla Luchmi Narain, of Bareilly, have been approved by the Superintendent of Vaccine Operations, and copies have been purchased for circulation. The poetical pamphlets are reprints.

Among miscellaneous pamphlets, His Highness the Maharajah of Vizianagram's lecture in English on the advantages of Foreign Travel is worth perusal.

Nos. 156 and 163 on the catalogue are two little works, due to the Prize Notification.

No. 159 is the Report of the Mahomedan Committee of Benares, or rather their Secretary's report. My review of this in detail is in your hands. It is an attack upon, and in some respects a mis-statement of, the educational policy of the Government. The point is that the enlightenment of the Native community should be left to Native management, of which the result by the showing of the report would be that denominational and class education alone would be encouraged.

As an explanation of the unwillingness of Mahomedans to accept State education it is suggestive though inconsistent. I have by me two reviews of the report by the *Indian Observer* and the *Englishman*, both able and fair. The former sees the reason of Mahomedan objections to taking advantage of Government Colleges and Schools, in their arrogance as a class

dertermind to stand aside and rest upon their traditions. The latter points out that the utterances of the English portion are those of a single individual. As regards the Urdu essays printed at the end of the report, which are more worthy of the attention of a critic, the reviewer admits that they contain elements of value, *viz.*, novelty, truth, and reflection, but he characterises the first as untrue, the second as truism, and the third as commonplace. With reference to the general tone of the report, the writer says well that there is no such thing as "English education." Education is a universal process for the development of the human faculties in the acquisition and pursuit of real knowledge in the interests of humanity, apart from class prejudices.

12. As regards the entries under Periodicals and Miscellaneous, in the first place they are incomplete, and in the second unnecessary. They should be unregistered in future, and every care be taken to give effect to the registration of books and pamphlets alone by pressure upon press proprietors. I would go so far as to make the sale of a book illegal unless it has been registered under the Act, and a note to that effect entered on the title page.

In conclusion, I observe that though there are mistakes in the catalogue, it is an improvement on last year's.

2.—*From* M. KEMPSON, ESQ., *Director of Public Instruction, North-Western Provinces, to* CURATOR OF GOVERNMENT BOOKS (*No.* 177).—*Dated Allahabad, the* 13*th April*, 1872.

I HAVE the honour of requesting your attention to the enclosed extract from the Government order on my report on the publications registered under Act XXV. of 1867 for 1871.

2. Mr. Lyall has written a note on the entries of the catalogue, which has not yet been sent on to this office. On receipt, it shall be forwarded to yourself for information and guidance. No doubt exactness in assigning to each book or pamphlet its position in the register as such is beyond the

capacity of the clerk in charge, but I think it would be wrong to sacrifice the distinction on this account. If the clerk be compelled to refer all cases in which he has doubt to yourself, I see no likelihood of similar errors to those which are named in the Government Order occurring again. As a rule, a pamphlet consists of a few leaves only unbound, but the subject-matter is the main index to its character; for all Native books are unbound, and many consist of only a few leaves. For general guidance the following come under the head pamphlets:—

(1.) Single or isolated extracts from prose or poetical works (a collection of extracts is a book).

(2.) Single essays or articles or *brochures*, especially if of passing interest only.

(3.) Single essays, &c., on detached branches of knowledge, literary, or scientific portions of a whole.

(4.) Sermons, speeches, proceedings of societies.

(5.) Single Acts or Orders.

Exceptional cases could always be decided on their merits.

3. With reference to paragraph 10, you should send a circular to registering officers asking them to receive reprints as usual, if they have discontinued the practice.

4. Care should be taken to enter only one copy of each edition in the catalogue. In looking through the shelves last December I found identical copies of the Koran entered.

5. In conclusion I would ask your attention to the printed catalogues of the educational works published at the Press. The copying clerk is not a sufficiently good scholar to give the titles correctly in the Roman character.

He writes *Ikhlaq* for *Akhláq*; *Hiqygool Mojudat* for *Háqáiqul Moujudát*; *Dhrum* for *Dharam*; *Taj Zindgi* for *Taj Zindagi*; *Chetr* for *Kshetr*, &c., &c. If he were required to master the literary transliteration system, and interpret the titles of the works accordingly, the character of the catalogue as a literary record would be immensely increased.

3.—*From* C. A. ELLIOTT, ESQ., *Secretary to Government, North-Western Provinces, to* M. KEMPSON, ESQ., *Director of Public Instruction* (*No.* 30).—*Dated Allahabad, the* 25*th June*, 1873.

I AM directed to acknowledge the receipt of your letter No. 4507, dated the 21st March last, being a report on the publications registered, under Act XXV. of 1867, during the year 1872.

2. There has been a very great decrease in the number of publications registered during the year, the total being 236 against 700 in 1871. The total number of copies of all kinds of works published and registered during the year is as shown in the margin, while that of *books* alone is 130,080 against 440,819 last year. The diminution is mainly attributable to the temporary omission during the period under report of reprints, which form so large a portion of the business of the Press in these Provinces—an omission which has altogether deranged the statistics of the year.

	No. of copies.
1st quarter, 1872,	91,909
2nd ditto, ...	57,242
3rd ditto, ...	37,895
4th ditto, ...	40,105
Total, ...	227,151

3. The results at the best are but scanty and poor. It is discouraging to find that, both in point of number and composition, literary effort in these Provinces is so inert and backward. Indeed, it would seem (apart from the omission of reprints) to have retrograded, although there is no apparent reason why it should have done so. The decrease is probably owing to some temporary cause, as there is reason to believe that the activity of the Press, though painfully distant from what it might be, is still on the increase.

4. Educational works keep the lead as hitherto, the number of copies issued forming 58½ per cent. of the whole. It is an interesting and hopeful sign that the Government series are beginning to be republished by Native presses. This should be encouraged, so long as the reprints are fairly got

up and the printing accurate. For the rest, we must wait the gradual expansion of education among the boys of Northern India, which will slowly but surely create a demand, and form a taste for reading.

5. The comparative absence of works of a low and deteriorating tendency is no doubt a subject of congratulation. But we must not be too sure that these are not surreptitiously printed and circulated. A very lamentable disclosure of the extent to which books of the very worst and most licentious class are obtainable in these Provinces has lately come under the notice of Government. Suitable measures have been devised for checking this great evil; and as a part thereof, a rigid enforcement of the law has been directed for the registration of all presses and of every printed book and paper. These measures will, it is hoped, meet the objects proposed in the third paragraph of your letter.

6. The decreasing activity of the Allygurh Scientific Society's Press is to be regretted.

7. Both as regards books and pamphlets, Urdu keeps the lead of Hindi. There were, indeed, only 45,900 copies of Urdu books published against 46,700 Hindi; but the great mass of the latter number belonged to the Educational Department.

8. The large decrease in the publication of oriental classical works is remarkable; but the chief business in this respect belongs to reprints, which are not represented in the present year.

9. The Lieutenant-Governor notices with approval the publication of such works as the Selections from Sadi's Bostan. The substitution of such works for the more than doubtful class of works which find ready admission into the Native classes, and even (as remarked by you) into some of our Mission Schools, is greatly to be desired.

10. His Honor is glad to find the Reverend A. F. R. Hoernle's "Analysis of Reid's Inquiry into the Human Mind" so high commended.

11. That portion of paragraph 9 of your letter, in which you propose to print all mathematical and other school-books in which figures and illustrations occur at the Roorkee College Press, will be forwarded to the Officiating Secretary to this Government in the Public Works Department, with reference to a pending discussion in the department as to the maintenance of that Press.

12. Your remarks on medical treatises are suggestive; but there is a difficulty in the formation of an eclectic method such as you delineate. The European system is not only strange and alien to the Native physician, but the difficulty of a terminology intelligible to him is almost insuperable without a previous knowledge of European languages.

13. The opinion of the Inspector-General of Civil Hospitals and Dispensaries, North-Western Provinces, will be asked on Imam-ood-deen's work on Practical Surgery, and he will be requested to state whether he considers it advisable to place copies in the dispensaries under his control.

14. It may be difficult to draw a strict line, capable of being always uniformly observed, for distinguishing pamphlets from books; but broadly and with some exceptions there should not be much practical difficulty in the matter, and the continued separation of the two is very necessary; and the instructions given by you in the annexure to your letter are judicious.

15. In conclusion, I am to convey to you the thanks of Government for your interesting report, and to state that it will, together with this reply, be printed in the *Selections from the Records of Government.*

Art. XXVIII.

REPORT ON THE WORKING OF THE DISTRICT DAKS IN THE NORTH-WESTERN PROVINCES FOR THE YEAR 1872-73.

1.—*From* C. W. HUTCHINSON, ESQ., *Postmaster-General, North-Western Provinces, to* C. A. ELLIOTT, ESQ., *Secretary to Government, North-Western Provinces, (No.* 3101 *)* —*Dated Nynee Tal,* 10*th June,* 1873.

I have the honor to submit the annual report on the working of the District Dâks in the North-Western Provinces for the year 1872-73.

2. Before proceeding to give the usual statistics, I shall notice briefly some of the principal changes that have taken place during the year.

3. Formerly there existed an Imperial mail line from Meerut to the railway station at Khoorjah, passing through Haupper and Boolundshuhur; but in June, 1872, the line having been abolished, arrangement was made for the conveyance of district mails between Khoorjah and Boolundshuhur and between Haupper and Meerut by rail, *viâ* Chola and Ghazeepore respectively, but the district authorities having brought to notice that this arrangement did not meet their requirements, I was obliged to put on runners from some available savings in the Meerut and Boolundshuhur Districts to establish direct communication between Haupper and Meerut and between Khoorjah and Boolundshuhur.

4. There was a district post-office at Balkha, in the Boolundshuhur District, costing Rs. 14 per mensem, but the In-

specting Postmaster of the division having brought to notice that the place was small and not sufficiently important to warrant the retention of the establishment, the office was abolished with the consent of the District Superintendent of Police.

5. In the Jounpore District the district post-office at Jalalpore was held in a rented house, which having come down during the late rains, and no other house being available there on the sanctioned rent of 8 annas a month, the district post-office was removed with the consent of the district authorities to Bakrabad, a village about a mile from Jalalpore.

6. In the Cawnpore District the mails for and from the police stations named in the margin were conveyed partly by runners and partly by rail, and consequently used to arrive in Cawnpore in the afternoon, to the great inconvenience of the district authorities.

Deyrapore.
Secundra.
Russoolabad.
Mungulpore.
Akberpore.
Gujnair.

At the suggestion of the Magistrate of the district, arrangements have been made, without any extra expenditure to the department, whereby the mails to and from the abovenamed police stations, though conveyed the whole distance by runners, now arrive in Cawnpore in time for an early morning delivery.

7. In the Allahabad District the railway employés at the Nawaie Railway Station were put to much inconvenience for want of a postal agency there. While the number of letters, &c., received and despatched, being small, did not warrant the establishment of an Imperial post-office, I have, with the consent of the district authorities, removed the district post receiving-house at Bharutgunj to Nawaiè, whereby the wants of the railway officials have been supplied without putting the

department to any extra charge, or causing any detriment to the district post service.

8. The police station at Amood, in the Humeerpore District, having been reduced, the district post receiving-house was also closed.

From enquiry it appears that Amood is a very small village, and a receiving-house there is not much needed; the requirements of the surrounding villages can be met by the neighbouring post-offices; or, if necessary, an extra peon will be given in the Raat post-office to deliver letters in the villages hitherto served by the head-peon allowed at Amood.

9. In Zillah Lullutpore the district post line from Khujuriah to Madowra having been reported impassable on account of wild beasts and numerous unbridged streams, the runners sanctioned for that line were taken off, and, with the concurrence of the local authorities, put between Mahrownee and Madowra.

10. In my annual report for the year 1870-71, I brought to the notice of Government that a District post-office was opened at Katima, in the Bareilly District, at the request of the Commissioner of the Rohilkhund Division; but in June, 1872, the Inspecting Postmaster, Bareilly Division, having reported that the police station at Katima was abolished, the district post-office was also closed, and intimation sent to the Magistrate of the district.

11. In Azimgurh, at the request of the Superintendent of Police, the district post-office at Mittoopore has been removed to Pawaie, and the runners sanctioned for the Mahool and Mittoopore line also put to work between Mahool and Pawaie. Some more changes have been made in the postal arrangement of this district to suit the new allocation of the

police stations lately sanctioned by Government, but as these changes were carried out in April, 1873, they will be more appropriately noticed in my next report to Government.

12. In April, 1872, the District Superintendent of Police at Meerut applied for the establishment of a district post-office at Mow Khas, on the road to Gurhmooktesur, where the police station from Gorah has been removed; but as the district post receiving-house at Gorah was kept up chiefly for the despatch and delivery of the police correspondence, I considered it advisable to transfer the head-peon from Gorah to Mow, instead of establishing a receiving-house at the latter place in addition to the one at the former; and, further, as Mow is situated on the mail line to Gurhmooktessur, the runner employed between Gorah and Shahjehanpore was also reduced, and thus, while supplying the wants of the Police Department, a saving of Rs. 48 per annum was effected in the cost of the establishment.

13. In the Moozuffernuggur District a receiving-house at Rahanah and a line of two runners were kept up, costing Rs. 186 per annum, but finding that Rahanah was a paltry village, there was no police station, and the number of letters received and despatched hardly warranted the retention of an office there, the receiving-house was closed with the concurrence of the district authorities.

14. Formerly there was a district post-office at Bhugwanpore, in the Saharunpore District, but the police outpost there having been abolished, the receiving-house was also closed in July, 1871, on the representation of the Inspector-General of Police; but as police seem to have been again quartered at Bhugwanpore, the Inspector-General has applied for the establishment of a district post-office there. I have instructed the Inspecting Postmaster, Meerut Division, to appoint a Mohurrir at Bhugwanpore from some available

savings in the Saharunpore District, and will make the necessary provision for a district post-office at Bhugwanpore in the tabular statement which I intend shortly to submit to Government for the general revision of the district post establishment throughout the North-Western Provinces.

15. The number of district post-offices, receiving-houses, and letter-boxes in the several districts of the North-Western Provinces on 1st April, 1872, stood at 421, of which the receipts of 15 offices named in the margin being found sufficiently large to cover the cost of the establishment, they were converted into Imperial post-offices, and the district post-offices at Katima (in Bareilly), Balkha (in Boolundshuhur), Amood (in Humeerpore), and Rahanah (in Moozuffernugger), as well as a letter-box at Bhankree, in the Allygurh District, being found unnecessary, were closed, leaving a balance of 401 post-offices and receiving-houses, &c., as detailed below :—

Munjhunpore in Allahabad District.
Bulwa in Benares District.
Bidhnoo in Cawnpore District.
Gujnair do.
Mungulpore do.
Shewly do.
Taligram in Futtehgurh.
Bilunda in Futtehpore.
Hutgaon do.
Kishenpore do.
Soomairpore in Humeerpore.
Koolpahar in do.
Goorsarai in Jhansie.
Rampore in Jounpore.
Jusrana in Mynpoory.

District post-offices in charge of Mohurrirs, ...	153
District post receiving-houses in charge of the head-peon, ...	233
Letter-boxes in charge of peons, ...	15
	401

16. An abstract of the number of covers received for delivery, and posted for despatch in the district post-offices, as compared with the result of the preceding year, is given below. It will be observed that there is a fair increase under each head except papers received for delivery.

	Covers received for Delivery.			Covers posted for Despatch.		
	Letters.	Papers.	Parcels.	Letters.	Papers.	Parcels.
Result for 1871-72, ...	654,387	31,348	5,321	585,532	3,430	2,571
Deduct on account District Post-offices converted into Imperial or closed during the year 1872-73, ...	9,917	405	...	6,756	151	164
Net result, ...	644,470	30,943	5,321	578,776	3,279	2,407
Result for 1872-73, ...	773,956	28,234	10,646	680,466	4,567	8,527
Increase, ...	129,486	...	5,325	101,690	1,288	6,120
Decrease, ...	...	2,709	...	...	...	...
Percentage of Increase,	16·73	...	50·01	14·97	28·20	74·11
Percentage of Decrease,	...	9·59	...	...	...	...

17. The decrease under the head "Papers," and the unusually large increase in parcels, appears to be due to the official covers open at both ends, which were erroneously entered as papers in the previous year's return being shown as parcels in the return for the year 1872-73. Hitherto book-post articles were included in parcels, as there was no separate column for their entry in the return, but in the new Post-office Manual, which came into force from the 1st April, 1873, the form of the return has been revised, and as the new form provides for the separate entry of packets, it is hoped there will be no more cause for similar mistakes in future.

18. The total number of covers returned undelivered by the district post-offices during the year is 77,894 letters, 705 papers, and 183 parcels, bearing the following proportion to the total sent for delivery:—

Letters.	*Papers.*	*Parcels.*
10·06	2·49	1·71

19. As already stated in previous reports, the above number includes the covers received by the district post-offices as missent, and returned to the head office for correct disposal, as well as the covers re-directed by the district post-offices, owing to the addressees having removed to some other places. The number of such missent and re-directed articles in the year 1872-73 was 59,003 letters, 492 papers, and 152 parcels, leaving the number of articles returned as actually unclaimed or refused, to stand at 18,891 letters, 212 papers, and 31 parcels, bearing a percentage to the total number sent for delivery of 2·44 letters, ·75 papers, and ·28 parcels. This result is satisfactory, and shows an improvement, though very slight, over the result of the preceding year.

20. A comparison of the gross number of letters, papers, and parcels passing through the Imperial as well as the District post-offices in the North-Western Provinces with the return of the year 1871-72 shews the following result :—

	Received.			*Posted.*		
	Letters.	Papers.	Packets and Parcels.	Letters.	Papers.	Packets and Parcels.
1871-72, ...	12,115,208	940,638	276,498	12,584,878	693,919	214,487
1872-73, ...	12,348,366	1,006,449	256,964	13,281,397	770,821	202,516
Increase, ...	233,158	65,811	...	696,519	76,902	...
Decrease, ...	...	...	19,534	...	...	11,971
Percentage { Increase,	1·92	6·99	...	5·53	11·08	...
Percentage { Decrease,	...	...	7·06	...	...	5·58

21. There is a fair increase in letters, and the result under the head "Newspapers" shows greater development. With regard to the falling-off in the parcels, the Local Government is probably aware that the Supreme Government have prohibited the post-offices on the railway lines from receiving parcels for any place on a railway. So long as gaps existed on the railway lines of the country, the post-office was of necessity resorted to by the public for the carriage of parcels, but now that continuous railway communication exists between so many of the chief towns in India, a gradual decrease in the parcel traffic of the Postal Department must naturally take place.

22. The financial result during the year under report is also satisfactory, inasmuch as the memo. below will show that out of Rs. 1,55,891 sanctioned by Government for the maintenance of the district post, Rs. 1,38,115 only was spent, the balance, Rs. 17,776, being deducted on account of fines and savings from the establishment.

MEMO.

	Rs.	Rs.
Amount allowed by Government for the maintenance of the district post, ...		1,55,891
Actually spent on account of pay of establishment, ...	1,34,978	
Ditto on account of contingencies, ...	3,137	
		1,38,115
Fines, ...	706	
Savings from establishment, ...	12,535	
Ditto from contingencies, ...	4,535	
		17,776
Total, ...		1,55,891

Return showing the Number of Covers sent for Delivery through and received for Despatch from the District Post in the North-Western Provinces for the year 1872-73.

Name of Division.	Name of District.	*Number of Covers sent to District Post.*			*Number of Covers received back from District Post undelivered.*			*Number of Covers received for disposal from District Post.*		
		Letters.	Papers.	Parcels.	Letters.	Papers.	Parcels.	Letters.	Papers.	Parcels.
Meerut.	Allygurh, ...	26,056	1,673	81	2,546	31	2	21,520	26	37
	Boolundshuhur, ...	35,316	1,349	148	2,858	52	5	32,065	24	95
	Dehra Doon, ...	5,288	882	83	579	29	3	4,159	12	51
	Meerut, ...	46,325	1,393	89	3,902	24	1	41,491	75	30
	Moozuffernuggur, ...	30,466	932	189	1,928	57	1	27,269	38	38
	Saharunpore ...	29,446	942	211	2,120	34	13	24,771	14	70
	Total, ...	172,897	7,171	801	13,933	227	25	151,285	189	321
Bareilly.	Bareilly, ...	22,596	682	277	2,950	23	21	21,272	41	294
	Bijnour, ...	11,183	364	41	684	20	2	10,540	34	7
	Budaon, ...	20,351	1,182	63	1,696	25	...	16,787	327	25
	Moradabad, ...	31,215	1,649	184	3,755	80	2	24,866	41	31
	Shahjehanpore, ...	14,511	571	122	1,348	9	2	15,876	10	20
	Teraie, ...	16,244	381	608	2,010	27	28	16,474	392	331
	Total, ...	116,100	4,829	1,295	12,443	184	55	105,815	845	708
Agra.	Agra, ...	14,019	732	309	1,500	9	5	11,210	2,662	379
	Etah,... ...	20,184	856	60	1,461	30	5	17,550	2	9
	Etawah, ...	21,991	1,876	132	2,374	21	5	18,627	148	50
	Futtehgurh, ...	33,544	576	436	2,708	5	10	33,745	40	68
	Muttra, ...	20,258	206	54	2,671	11	1	15,623	7	11
	Mynpoory, ...	25,577	775	187	3,277	3	12	19,198	205	137
	Total, ...	135,573	5,021	1,178	13,991	79	38	115,953	3,064	654

Return showing the number of Covers sent for Delivery through and received for Despatch from the District Post in the North-Western Provinces for the year 1872-73.

Name of Division.	Name of District.	*Number of Covers sent to District Post.*			*Number of Covers received back from District Post undelivered.*			*Number of Covers received for disposal from District Post.*		
		Letters.	Papers.	Parcels.	Letters.	Papers.	Parcels.	Letters.	Papers.	Parcels.
Allahabad.	Allahabad, ...	40,755	560	4,949	7,087	45	14	28,993	61	4,914
	Banda, ...	15,584	515	467	1,291	20	6	20,157	37	799
	Cawnpore, ...	17,582	459	124	2,972	7	6	15,487	5	158
	Futtehpore, ...	25,719	173	158	4,069	3	5	20,485	59	44
	Humeerpore, ...	20,167	232	114	1,542	2	...	21,515	26	37
	Jounpore, ...	30,204	507	208	3,381	15	6	18,845	13	18
	Total, ...	150,011	2,446	6,020	20,332	92	37	125,482	201	5,970
Benares.	Azimgurh, ...	28,806	995	109	2,939	40	1	22,442	32	39
	Benares, ...	11,282	196	54	471	2	...	7,532	2	11
	Bustee, ...	22,827	925	175	2,086	12	4	18,416	33	301
	Ghazeepore, ...	23,432	338	54	1,799	1	3	20,062	1	10
	Goruckpore, ...	30,424	1,398	148	3,615	23	5	26,000	52	115
	Mirzapore, ...	28,953	1,451	90	2,692	13	1	28,133	56	112
	Total, ...	145,724	5,304	630	13,603	91	14	122,585	176	588
Jhansie.	Jhansie, ...	22,190	1,848	437	1,471	16	5	25,601	37	162
	Lullutpore, ...	15,070	713	173	1,029	11	9	15,713	6	67
	Oraie, ...	16,391	902	112	1,092	5	...	18,032	49	57
	Total, ...	53,651	3,463	722	3,592	32	14	59,346	92	286
	Grand Total, ...	773,956	28,234	10,646	77,894	705	183	680,466	4,567	8,527

Return showing the Number of Covers received for Delivery and posted for Despatch in the several Post-offices in the North-Western Provinces during the year 1872-73.

Name of District.	*Number of Covers received for Delivery.*			*Number of Covers posted for Despatch.*		
	Letters.	Papers.	Parcels.	Letters.	Papers.	Parcels.
Agra, ...	967,249	71,458	17,439	1,049,642	418,998	19,399
Allahabad, ...	1,068,198	109,496	38,000	845,152	73,692	48,526
Almorah, ...	110,679	21,945	5,359	149,014	6,752	1,824
Allygurh, ...	501,394	28,705	6,560	845,152	21,274	9,396
Azimgurh, ...	269,820	13,853	2,647	257,038	5,142	1,936
Banda, ...	181,156	10,155	2,839	255,716	1,605	1,460
Bareilly, ...	477,998	52,367	13,120	491,379	7,938	8,996
Benares, ...	706,044	58,545	13,107	609,774	17,590	12,025
Bijnour, ...	231,725	11,484	2,298	285,537	3,970	754
Boolundshuhur ...	336,008	12,442	4,005	386,853	4,157	3,869
Budaon, ...	168,546	13,233	2,453	164,308	2,153	1,257
Bustee, ...	148,144	9,290	2,206	135,800	3,817	1,873
Cawnpore, ...	775,951	61,059	11,847	865,780	24,139	8,740
Dehra Doon, ...	431,337	100,779	17,552	473,191	22,600	10,136
Etah, ...	165,571	7,509	1,978	156,277	1,160	705
Etawah, ...	244,881	15,412	1,844	502,155	9,349	1,876
Futtehgurh, ...	430,520	16,984	5,127	346,193	1,800	3,070
Futtehpore, ...	191,791	8,300	3,155	187,985	829	1,843
Ghazeepore, ...	484,474	19,246	5,082	501,753	4,526	3,663
Goruckpore, ...	288,528	17,071	4,958	305,285	4,711	2,829
Humeerpore, ...	129,806	6,360	2,390	88,998	862	1,409
Jhansie, ...	207,668	17,837	5,958	277,009	3,475	3,846
Jounpore, ...	189,649	11,121	2,805	234,782	4,541	1,063
Lullutpore, ...	65,479	3,975	1,830	41,777	86	642
Meerut, ...	702,292	89,772	16,009	691,434	38,177	17,184
Mirzapore, ...	423,100	24,424	4,729	508,133	4,668	3,838
Moradabad, ...	505,137	41,030	8,700	749,772	47,473	3,805
Moozuffernuggur	237,211	8,875	2,223	264,866	2,137	1,138
Muttra, ...	368,631	19,746	5,150	633,689	2,999	2,751
Mynpoory, ...	176,490	9,608	2,950	187,901	1,593	1,539
Nynee Tal, ...	326,639	51,160	23,824	324,250	13,566	7,668
Oraie, ...	148,709	7,826	2,382	172,137	1,855	1,659
Saharunpore, ...	448,615	38,233	10,859	391,520	9,164	8,235
Shahjehanpore, ...	236,926	17,149	5,272	286,546	4,834	3,862
Total, ...	12,348,366	1,006,449	2,56,964	13,281,397	770,821	202,516

2.—*From* C. W. HUTCHINSON, ESQ., *Postmaster-General, to* C. A. ELLIOTT, ESQ., *Secretary to Government, North-Western Provinces, (No.* 5980).—*Dated Nynee Tal, the* 11*th September*, 1873.

I HAVE the honour to acknowledge the receipt of your letter No. 1976, dated 8th ultimo, and in reply beg to state, for the information of Government, that the favourable result shown in my report is mainly attributable to the recent extension of the operation of the district post, and the consequent facility afforded to the rural public for the despatch and delivery of their correspondence; but I do not think that the extension of the District Dâk has occasioned any greater amount of letter writing than before, but private messengers are less used, and the Post-office more resorted to, in districts where formerly there was no postal communication.

2. With reference to the 3rd paragraph of your letter under acknowledgment, I beg to submit a statement (Appendix A.) showing distinctly the percentage of the correspondence (letters) in the several districts in the North-Western Provinces on the total and educated portion of the population of each, which I trust will be found to contain the information required by His Honor. I have not included in the return the correspondence received for delivery, as it would have amounted to a repetition of the same item, and thereby falsified the result,—the correspondence shown as posted in the return of one post-office being exhibited as received in that of the other.

3. I also submit two abstracts, marked B. and C., prepared from the above return, which I trust will enable His Honor to ascertain at a glance the position of each district in the North-Western Provinces according to the proportion, high or low, which its correspondence bears to the mass of population as well as to the educated portion of the community.

4. The present returns do not show distinctly the portion of official and non-official correspondence, nor a sub-division

of the latter into English and Vernacular covers ; but as His Honor is anxious to have the above information, necessary steps will be taken to furnish the same in my future annual reports.

5. With regard to the discrepancy in the item of expenditure, I beg to observe that the sum of Rs. 1,55,891, noted in my memorandum, is that sanctioned in your letter No. 1,779A., dated 18th April, 1871, for the maintenance of the District Post in the North-Western Provinces, while the amount stated by the Accountant-General appears to be that provided in the Budget Estimate. I have, however, addressed that officer on the subject, and will submit a further report on receipt of his reply.

APPENDIX A.

Statement showing the percentage of correspondence on the general and educated portion of population in the several districts of the North-Western Provinces, for the year 1872-73.

Name of District.	Total number of letters posted.	Total population of each district.	Percentage of correspondence.	Educated population.	Percentage of correspondence to educated population.	Remarks.
Agra... ...	1,060,852	1,094,184	96·95	27,191	3,901·48	
Allahabad ...	874,145	1,394,245	62·69	19,958	4,379·92	
Allygurh ...	866,672	1,073,108	80·76	23,837	3,635·82	
Azimgurh ...	279,480	1,531,410	18·24	16,930	1,650·79	
Banda ...	276,873	697,611	39·54	12,775	2,159·47	
Bareilly ...	512,651	1,506,801	34·02	21,886	2,342·36	
Benares ...	617,306	793,699	77·77	30,670	2,012·73	
Bijnour ...	296,077	737,152	40·16	8,249	3,589·24	
Boolundshuhur ...	418,918	936,593	44·72	18,122	2,311·65	
Budaon ...	181,095	934,348	19·38	9,929	1,823·89	
Bustee ...	154,216	1,472,994	10·47	5,174	2,980·59	
Cawnpore ...	881,267	1,155,439	76·27	32,284	2,729·73	
Dehra Doon ...	477,360	115,711	412·54	3,162	15,096·77	
Etah	173,827	703,485	24·70	11,813	1,471·48	
Etawah ...	520,782	668,581	77·89	8,390	6,207·17	
Futtehgurh ...	379,938	918,748	41·35	17,857	2,127·67	
Futtehpore ...	208,470	663,815	31·40	12,765	1,633·13	
Ghazeepore ...	521,815	1,345,401	38·78	16,085	3,214·10	
Goruckpore ...	331,235	2,019,850	16·40	23,557	1,406·10	
Humeerpore ...	110,513	529,137	20·88	11,104	995·25	
Jhansie ...	302,610	317,735	95·24	8,912	3,395·53	
Jounpore ...	253,627	1,025,869	24·72	8,657	2,929·73	
Kumaon ...	477,103	743,170	64·19	32,197	1,481·82	
Lullutpore ...	57,490	212,628	27·03	2,999	1,916·97	
Meerut ...	732,925	1,273,914	57·53	24,106	3,040·42	
Mirzapore ...	536,266	1,065,293	52·81	23,941	2,239 94	
Moradabad ...	774,638	1,122,131	69·03	21,155	3,661·72	
Moozuffernuggur	292,135	690,082	42·33	16,997	1,718·74	
Muttra ...	649,312	887,355	73·17	13,353	4,862·66	
Mynpoory ...	207,099	765,783	27·04	9,298	2,227·35	
Oraie ...	190,169	404,384	47·02	12,582	1,511·43	
Saharunpore ...	416,291	883,782	47·10	6,211	6,702·47	
Shahjehanpore ...	302,422	949,471	31·85	18,592	1,626·36	
Terai... ...	16,474	185,647	8·87	1,446	1,139·28	
Total ...	14,351,053	30,769,056	46·64	532,184	2,696·25	

APPENDIX B.

List of Districts, arranged according to the proportion of percentage of correspondence on their total populations.

Name of District.	Total number of letters posted.	Total population of each District.	Percentage of correspondence to the population.	Remarks.
Dehra Doon	477,860	115,711	412·54	
Agra	1,060,852	1,094,184	96·95	
Jhansie	302,610	317,735	95·24	
Allygurh	866,672	1,073,108	80·76	
Etawah	520,782	668,581	77·89	
Benares	617,306	793,699	77·77	
Cawnpore	881,267	1,155,489	76·27	
Muttra	649,312	887,355	73·17	
Moradabad	774,638	1,122,131	69·03	
Kumaon	477,103	743,170	64·19	
Allahabad	874,145	1,394,245	62·69	
Meerut	732,925	1,273,914	57·53	
Mirzapore	536,266	1 015,293	52·81	
Saharunpore	416,291	883,782	47·10	
Oraie	190.169	401,384	47 02	
Boolundshuhur ...	418,918	936,593	44·72	
Moozuffernuggur ...	292,135	690,082	42·33	
Futtehgurh	379,938	918,748	41·35	
Bijnour	296,077	737,152	40·16	
Banda	275,873	697,611	39·54	
Ghazeepore	521,815	1,345,401	38·78	
Bareilly	512,651	1,506,801	34·02	
Shahjehanpore ...	302,422	949,471	31·85	
Futtehpore	208,470	663,815	31·40	
Mynpoorie	207,099	765,783	27·04	
Lullutpore	57,490	212,628	27·03	
Etah	173,827	703,485	24·70	
Jounpore	253,627	1,025,869	24·72	
Humeerpore	110,513	529,137	20·88	
Budaon	181,095	934,348	19·38	
Azimgurh	279,480	1,531,410	18·24	
Goruckpore	331,235	2,019,350	16·40	
Bustee	154,216	1,472,994	10·47	
Terai	16,474	185,647	8·87	
Total ...	14,351,053	30,769,056	46·64	

APPENDIX C.

List of Districts, arranged according to the proportion of percentage of correspondence on their educated population.

Name of District.	Total number of letters posted.	Educated population.	Percentage of correspondence to educated population.	Proportion of correspondence per head per annum.
Dehra Doon	477,360	3,162	15,096·77	150·96
Saharunpore	416,291	6,211	6,702·47	67·02
Etawah	520,782	8,390	6,207·17	62·07
Muttra	649,312	13,353	4,862·66	48·62
Allahabad	874,145	19,958	4,379·92	43·79
Agra	1,060,852	27,191	3,901·48	39·01
Moradabad	774,638	21,155	3,661.72	36·61
Allygurh	866,672	23,837	3,635·82	36·35
Bijnour	296,077	8,249	3,589·24	35·89
Jhansie	302,610	8,912	3,395·53	33·95
Ghazeepore	521,815	16,085	3,244·10	32·44
Meerut	732,925	24,106	3,040·42	30·40
Bustee	154,216	5,174	2,980·59	29·80
Jounpore	253,627	8,657	2,929·73	29·29
Cawnpore	881,267	32,284	2,729·73	27·29
Bareilly	512,651	21,886	2,342·36	23·42
Boolundshuhur	418,918	18,122	2,311·65	23·11
Mirzapore	536,268	23,941	2,239·94	22·39
Mynpoory	207,099	9,293	2,227·35	22·27
Banda	275,873	12,775	2,159·47	21·59
Futtehgurh	379,938	17,857	2,127·67	21·27
Benares	617,306	30,670	2,012·73	20·12
Lullutpore	57,490	2,999	1,916·97	19·16
Budaon	181,095	9,929	1,823·39	18·23
Moozuffernuggur ...	292,135	16,997	1,718·74	17·18
Azimgurh	279,480	16,930	1,650·79	16·50
Futtehpore	208,470	12,765	1,633·13	16·33
Shahjehanpore	302,422	18,595	1,626·36	16·26
Oraie	190,169	12,582	1,511·43	15·11
Kumaon	477,103	32,197	1,481·82	14·81
Etah	173,827	11,813	1,471·48	14·71
Goruckpore	331,235	23,557	1,406·10	14·06
Terai	16,474	1,446	1,139·28	11·39
Humeerpore	110,513	11,104	995·25	9·95
Total ...	14,351,053	532,184	2,696·25	26·96
Deduct children under 12 years of age who do not use the post ...		73,687	...	...
Balance ...		458,497	3,130·02	31·30

3.—*From* C. A. ELLIOTT, ESQ., *Secretary to Government, North-Western Provinces, to the* POST-MASTER GENERAL, *North-Western Provinces,* (*No.* 881).—*Dated Allahabad, the 7th October,* 1873.

I AM directed to acknowledge the receipt of your letter No. 5980, dated 11th September, submitting statistics showing the amount of correspondence passing through the Post Office, as compared with the population, educated and uneducated, of the several districts in the North-Western Provinces.

2. In reply I am to thank you for the returns supplied and for your promise of further information regarding official and non-official correspondence. I am also to request that you will not lose sight of the wish of Government, that in the returns of correspondence the number of letters written in the Oordoo and the Hindee characters may be shown separately.

Art. XXIX.

REPORT ON THE ACTUAL OUTTURN OF THE COTTON CROP, NORTH-WESTERN PROVINCES, FOR 1872-73.

1.—*From* E. C. BUCK, ESQ., *Officiating Secretary to Board of Revenue, North-Western Provinces, to* A. COLVIN, ESQ., *Officiating Secretary to Government, North-Western Provinces* (*No.* 557).—*Dated Allahabad, the* 21*st May*, 1873.

I AM desired by the Board of Revenue to submit, for the information of the Hon'ble the Lieutenant-Governor, a report on the actual outturn of the cotton crop in the districts of the North-Western Provinces for the year 1872-73.

2. The Collectors of Ghazeepore and Benares having reported that the crop will not be gathered till the end of this month, the estimated acreage and outturn for those districts have been shown under the head "Actuals," in order to complete the totals given in the general comparative statement. In any case the general results for the Province will hardly be affected thereby, as His Honor is aware that the cultivation of cotton is not carried on to any great extent in the districts of the Benares Division.

3. The following abstract statement shows the estimated and actual area and outturn for the Province during the year 1872-73 :—

Division.	*Area and outturn in maunds of 40 seers or 80 lbs.*						
	1872-73.			1872-73.			
	Estimates.		Outturn per acre.	Actuals.		Outturn per acre.	In lbs.
	Acres.	Maunds.	M. s. c.	Acres.	Maunds.	M. s. c.	
Meerut, ...	2,76,207	349,215	1 10 9	278,846	3,48,571	1 10 0	
Kumaon, ...	3,598	2,198	0 24 6	3,598	2,178	0 24 3	
Rohilkhund,	151,702	97,129	0 25 10	174,800	1,04,023	0 23 13	
Agra, ...	424,634	588,077	1 15 6	436,431	5,93,374	1 14 6	
Jhansie, ...	78,532	48,095	0 24 7	76,670	41,044	0 21 6	
Allahabad, ...	277,530	128,086	0 18 7	274,247	1,22,139	0 17 13	
Benares, ...	21,550	8,323	0 15 7	21,419	8,302	0 11 12	
Total, ...	1,233,753	1,221,123	0 39 7	1,266,011	12,19,631	0 38 8	

4. From the above it will be seen that the actual area under cotton during the year was 1,266,011 acres against an estimate of 12,33,753 acres, being an increase of 32,258 acres.

5. The outturn for the Province was estimated at 1,221,123 maunds of cleaned cotton, or an average of 39 seers 7 chittacks per acre, and the actual outturn has been 1,219,631 maunds, or an average of 38 seers 8 chittacks. The decrease is, therefore, 1,492 maunds.

6. The difference between the estimated and the actual outturn is very small, but the area brought under cultivation was considerably increased, especially in the Budaon and Agra Districts. There was, however, a marked diminution in the Allahabad division.

7. A separate report (No. 456, dated the 23rd April, 1873) has been submitted regarding the variation in the produce rate, which, as usual, has a wide range, rising from 17-14 in Allahabad to 1-14-6 in Agra.

8. In a few districts the crop suffered to some extent from heavy falls of rain, but, on the whole, the yield has been singularly good compared with that of the last seven years, as the following table will show:—

	lbs.		lbs.
Average of seven years,...	61,378,131	1865-66,...	... 62,663,280
Excess of outturn of 1872-73, ...	... 36,192,349	1866-67, ...	... 85,684,920
		1867-68, ...	... 57,875,120
		1868-69, ...	... 44,137,840
		1869-70, ...	... 37,104,160
		1870-71, ...	... 76,387,600
		1871-72, ...	... 65,794,000
Outturn of 1872-73,	... 97,570,480	Total,	...429,646,920
		Average of 7 years,...	61,378,131

9. The outturn of the year under notice has been, therefore, nearly half as much again as the average outturn.

10. In their last review, the Government desired that enquiry should be made whether each district raises enough cotton to clothe its own population. The result of the Board's enquiry is given in the abstract herewith sent. The following tabular statement shows the actual produce of 1872-73 in lbs., and the amount required for each district, at 2 lbs. per head of the population. In a few instances the figures in this statement do not correspond with those given in the abstract, District Officers having used a maund of more than 80lbs. in their calculation, whereas the figures given in the following statement have been calculated in every instance at 80lbs. per maund. The difference amounts to 251,031 lbs.:—

District.	Actual produce, 1872-73.	Population as per Census.	Amount at 2lbs. per head of the population.	Excess.	Deficiency.
	lbs.		lbs.	lbs.	lbs.
Dehra Doon, ...	2,800	102,831*	205,662	...	202,862
Saharunpore, ...	3,126,800	880,663	1,761,326	1,365,474	...
Moozuffernuggur,	3,178,000	690,210	1,380,420	1,797,580	...
Meerut, ...	6,311,680	1,271,454	2,542,908	3,768,772	...
Boolundshuhur,	8,805,760	800,431*	1,600,862	7,204,898	...
Allygurh, ...	6,460,640	1,068,555	2,137,110	4,323,530	...
Kumaon, ...	20,400	385,790*	771,580	...	751,180
Gurhwal, ...	...	248,742*	497,484	...	497,484
Terai Pergunnahs,	153,840	185,760	371,520	...	217,680
Bijnour, ...	1,878,160	714,415	1,428,830	449,330	...
Moradabad, ...	2,375,040	1,095,306	2,190,612	184,428	...
Budaon, ...	2,606,880	889,810*	1,779,620	827,260	...
Bareilly, ...	1,080,560	1,506,547	3,013,094	...	1,932,534
Shahjehanpore,	381,200	945,705	1,891,410	...	1,510,210
Muttra, ...	18,561,440	890,147	1,780,294	16,781,146	...
Agra, ...	12,764,160	1,096,450	2,192,900	10,571,260	...
Furruckabad, ...	1,212,720	918,570	1,837,140	...	624,420
Mynpoory, ...	2,071,300	755,000	1,510,000	561,200	...
Etawah, ...	5,376,000	626,444*	1,252,888	4,123,112	...
Etah, ...	7,484,400	700,688	1,401,376	6,083,024	...
Jaloun, ...	2,533,360	371,532	743,064	1,790,296	...

Note.—The entries marked thus * have been taken from the Census Report of 1865, and the rest from the present Census as given by District Officers.

District.	Actual produce, 1872-73.	Population as per Census.	Amount at 2 lbs. per head of the population.	Excess.	Deficiency.
	lbs.		lbs.	lbs.	lbs.
Jhansie, ...	701,920	320,008	640,016	61,904	...
Lullutpore, ...	48,240	212,628	425,256	...	377,016
Cawnpore, ...	2,970,000	1,174,554	2,349,108	620,892	...
Futtehpore, ...	806,480	661,529	1,323,058	...	516,578
Banda, ...	3,812,240	696,443	1,392,886	2,419,354	...
Allahabad, ...	768,880	1,382,286	2,764,572	...	1,995,692
Humeerpore, ...	1,391,200	527,535	1,055,070	336,130	...
Jounpore, ...	22,320	1,015,427*	2,030,854	...	2,008,594
Goruckpore, ...	32,640	1,983,816	3,967,632	...	3,934,932
Bustee, ...	960	1,487,572	2,975,144	...	2,974,184
Azimgurh, ...	6,880	1,385,872*	2,771,744	...	2,764,864
Mirzapore, ...	491,360	1,054,413*	2,108,826	...	1,617,466
Benares, ...	94,960	793,277*	1,586,554	...	1,491,594
Ghazeepore, ...	37,360	1,842,455*	2,684,910	...	2,647,550
Total, ...	97,570,480	30,182,865	60,365,730	63,269,590	26,064,840

Note.—The entries marked thus * have been taken from the Census Report of 1865, and the rest from the present Census as given by District Officers.

11. This table shows that if the 2lbs. calculation is approximately true, nearly one-half of the districts in the province do not produce a sufficient quantity of cotton to clothe their own population.

12. After allowing 26,064,840lbs. to meet the deficiency in those districts, the net surplus for exportation is 37,204,750lbs. But the table in paragraph 8 shows that the outturn of the year was 36,192,349 in excess of the average outturn of the seven previous years. The average surplus for exportation would, therefore, be only 1,012,401lbs., or 3,375 bales of 300lbs. in an average year.

13. This result cannot be a correct one, and the error in it must be due either to a miscalculation of the quantity of cotton used by the people or of the produce per acre.

14. There is probably some error in both. The calculation of 2lbs. per head was founded on enquiries made by

Luchmun Singh, Deputy Collector of Boolundshuhur, which were confined to the northern districts. Now it is well known that the agricultural population of the Lower Doab are living at a lower scale of comforts than in the Upper Doab. From enquiries made in one of the districts of the Lower Doab it appears not uncommon for a man to make his pair of *dhotees* (or waist clothes) last for eighteen months or two years. Luchmun Singh allows a new pair every year to the poorest classes. As a pair of *dhootees* is estimated to contain one seer of cotton, and the poorest (or third class of Luchmun Singh) form about two-thirds of the population, an alteration in this item seriously affects the general average.

Again, whole families in the district referred to have no *razaees*, (or cotton-lined coverlets), whereas Luchmun Singh allows one for every adult. It must also be remembered that when the cotton outturn is small, or the price high, the consumption falls much below the average.

15. Luchmun Singh originally calculated 1½ seers as the average quantity per head, of which one-third was European cloth, and the remainder, 1 seer, (or 2lbs.), country cloth. But the Assistant Collector of Mynpoory (who is the only officer who has made any careful enquiry into this question) is of opinion that 60 per cent. of the cloth used is European! On the other hand, he estimates the total quantity of cloth used as greater than that given by Luchmun Singh. The net result is, that 2lbs. per head of country cotton is an over-estimate.

16. On the above consideration, it appears advisable to reduce the estimate of home consumption, and to assume 1½lbs. per head as the minimum average of consumption of country cotton. The additional surplus under this calculation is, then, 15,091,432lbs., or 50,305 bales of 300lbs. each, the amount at 1½lbs. per head being 45,274,298lbs.

17. But the possible error in the produce is much greater. There is no doubt that the outturn per acre should be

more equalized in the different divisions. The soil and condition of the Agra and Allahabad Divisions, for instance, are not so different that there can be a difference of 108lbs. and 36lbs. in the outturn per acre. Looking to the results obtained with country cotton on the Government farms, and the statistics given by some of the officers, the Board would not estimate the outturn for the present year at less than 100lbs. per acre all round, and are inclined to think that the average may have been greater. The season was unusually favourable, and from every direction excellent crops were reported. In two of the experiments tried on the Cawnpore Farm, indigenous cotton was grown in the native fashion on very indifferent soil. The result was in both cases more than 300lbs. an acre.

18. In Benares, where a good deal of Manowa cotton is grown, the outturn is probably less than elsewhere, for, as was explained in the separate report submitted on the subject of Manowa cotton, the outturn of Manowa is less in weight than the outturn of ordinary country cotton. On the other hand, there is reason to believe that the outturn in other divisions has been under-estimated. A great deal of the cotton in the Central Doab is grown in highly-manured fields, and in such fields there is no reason why, in a good year, the results obtained should not approximate the results obtained in the model farm at Cawnpore. At the Boolundshuhur and Allahabad Model farms the results were not so good as at Cawnpore; Allahabad gave 97lbs. of cleaned country cotton, and Boolundshuhur 87 to 128lbs.; but at both farms the conditions were more unfavourable than at Cawnpore.

19. An estimate of 100lbs. per acre is thus probably under, rather than over, the mark. The area under cotton was 1,266,011 acres: at 100lbs. an acre the produce would be 126,601,100lbs. The amount required for home consumption at 1½lbs. per head has been estimated at 45,274,298lbs.; the surplus for export is, therefore, 81,326,802lbs.

20. The only return of cotton export is that from Agra, by Messrs. Schlaepfer, Putz and Co. The stock on hand at the commencement of the year is stated to have been 70,000 maunds, and the quantity exported from 1st April, 1872, to 1st April, 1873, 449,272 maunds. Much of this cotton must have come from Rajpootana and Gwalior.

21. In the returns of the East Indian Railway for 1871-72, quoted in Watson's Cotton Press Circular, the exports of cotton from Cawnpore, Agra, and Delhi are given as follows :—

	1871.	1872.
	Maunds.	*Maunds.*
Cawnpore, ...	299,824	291,903
Agra, ...	722,118	598,373
Delhi, ...	377,046	265,797
Maunds of 82lbs., ...	1,398,988	1,156,073
or in lbs., ...	114,717,016	94,797,956

Again, Messrs. Nicol, Fleming and Co.'s Trade Circulars give as the imports to Calcutta in 1872-73:—

	1872.	1873.
Bales of 300lbs. each, ...	370,784	203,385
= in lbs.	111,235,200	61,031,500

22. Calcutta must have taken almost all the cotton exported from the North-Western Provinces and Punjab, with the exception of the quantity taken by Oudh and Bengal, for in the year 1870-71 only 160,000lbs. left the East Indian Railway for the Great Indian Peninsula Railway; which quantity, compared with the total export, is insignificant. On the other hand, little or no cotton can have reached Calcutta from any other quarter except Gwalior.

23. The exports from Delhi, and so much of the exports from Agra as come from Gwalior and Rajpootana, must be subtracted from Messrs. Nicol and Fleming's figures, in order to obtain an estimate of the exports of the North-Western Provinces

to Calcutta. On the other hand, a return of the cotton transferred from the North-Western Provinces to Oudh and Bengal is necessary in order to arrive at a sound estimate of the entire exports. The amount of cotton transferred to Oudh would be approximately shown by the returns of traffic over the Cawnpore bridge, and the amount transferred to Bengal by the returns of river and railway traffic. These will be called for. Returns from the East Indian Railway and Ganges bridges will probably show the imports from Gwalior and Rajpootana; but until these returns are obtainable, the quantity exported can only be guessed.

24. The figures quoted will, however, give some indication of the amount exported during the last two or three years. The quantity which went to Calcutta from the North-Western Provinces alone, in 1871 and 1872, can hardly have been less than 50,000,000lbs. in each year. The estimate of the exportable outturn of the present year, deduced from the produce returns is given as 81,326,802lbs., but the outturn of this year is supposed to be some 36,000,000lbs. in excess of the outturn of ordinary years. (The excess will be greater at the increased rate assumed in paragraph 19.) The average exportable outturn is, by this calculation, under 50,000,000lbs., which leaves no margin for export to Oudh.

25. The conclusion remains, therefore, that the estimate of paragraph 19 is, as it was supposed to be, under, rather than over, the mark.

26. I am desired to draw attention to the remarks of Messrs. Schlaepfer, Putz and Co. on the damaging effect on the demand for North-Western cotton produced by the adulteration of new with old cotton, and also to the statement by Mr. Gilmore, that the staple of this year is weaker and not so good in colour as the staple of last year.

27. There appears to be nothing more in the District Officers' reports which calls for special notice. A few of the

reports are, however, somewhat lengthy, and of more than ordinary interest. These are submitted in original for the information of Government.

28. A copy of this report will be forwarded direct to the Chamber of Commerce.

Abstract of replies to Board's Circular No. N., dated the 4th February, 1873, calling for the information asked in para. 7 of G. O. No. 738A., dated the 21st May last.

District.	Reply.
	Meerut Division.
Dehra Doon, ...	The produce of this district does not suffice for home consumption. Cotton is imported from the plains to meet the wants of the district.
Saharunpore, ...	States that the District of Saharunpore raises more cotton than is required for its use, and about half of the produce is annually exported. The figures are—actual produce of cotton in 1872 in lbs. 3,204,970, and the amount at 2lbs. per head of the population, 1,761,326.
Moozuffernuggur, ...	States that there is no doubt but that this district gives more cotton than is sufficient for clothing its own population, and exports in a south-easterly direction towards Cawnpore, &c.
Meerut, ...	States that the outturn for 1872-73 is given as 6,311,720lbs. The population of the district, according to the Census of 1872, is 1,271,454; taking the average consumption of cotton at 2lbs. per head of the population, this district would require 2,542,908lbs. to supply its own wants; leaving a surplus of 3,768,812lbs., or about 12,562 bales of 300lbs. each for exportation—in other words, the surplus produce of the Meerut District alone amounts to nearly two-thirds of the whole quantity, which, according to the process of calculation adopted in paragraph 6 of Government letter No. 738A., dated 21st May, 1872, is the surplus produce of the North-Western Provinces.
Boolundshuhur, ...	By a rough estimate, one-third of the quantity produced will be kept in the district for the use of the native looms, and the remainder will be exported. Of the said one-third (or 36,691 maunds), about 2,000 maunds will be required for the consumption of the district, and 16,691 maunds will be exported in the shape of country cloth.

District.	Reply.
Allygurh,	The entire produce of the district is 80,758 maunds, which amounts to 7,268,220lbs. at 90lbs. per maund. The population of the district, according to the late Census, is 1,068,555, on which, taking 2lbs. for consumption per head, the expenditure of the whole amounts to 2,137,110lbs., which, being subtracted from the outturn of the district, leaves 5,131,110lbs. for exportation.
	Kumaon Division.
Kumaon,	States that Kumaon does not raise enough cotton to clothe its own population; it produces about 255 maunds, or 20,400lbs., which would not be sufficient for the wants of even a fortieth part of the population.
Terai,	States that this district does not, as a whole, raise enough cotton to clothe its own population. The actuals for the year 1872-73 show an outturn of 1,923 maunds of cleaned cotton only, whilst the population, as shown by the Census of 1872, was 185,760.
	Rokilkhund Division.
Bijnour,	The cotton produced in this district is more than sufficient for the supply of it. At the rate of 2lbs. per man, 1,428,830lbs. would be required for home consumption, leaving 449,382lbs. for export to the eastward.
Moradabad,	Allowing 2lbs. per head of the population, 2,190,612lbs. of cotton are required for local consumption. Thus, but 184,428lbs. are available for export. Further states that had he any means of knowing what the actual export from the district was, he might have tested the correctness of the recorded outturn, but he has no return of import or export.
Budaon,	The total actual outturn of the crop reported is in excess of local consumption, calculated at 2lbs. per head of population. Cotton is exported from this to other districts. Much of it goes to Chundowsee, and a good deal is shipped at Mutchla Ghât for other districts. The District of Budaon, therefore, raises more than enough cotton to clothe its own population.
Bareilly,	The total population of the district, as ascertained by the late Census, is 1,506,547. At the average rate of consumption of 2lbs. per head, the district would require 37,663 maunds 27 seers to meet its requirements. The quantity actually produced was only 13,507 maunds. The difference was covered by imports from Moradabad, Muttra, Allygurh and Meerut.

District.	Reply.
Shahjehanpore, ...	States that the population of this district, according to the Census of 1872, is 945,705; 1,891,410lbs. of cotton would therefore be required for consumption at the rate of 2 lbs. per head, and the present outturn falls at only 6·6 ozs.
	Agra Division.
Muttra,	It is clear that the actual outturn is far greater than is necessary for the consumption of the population of the district at 2lbs. per head. The total population of the district is 890,147 souls. At this rate of 2lbs. per head they would require 22,253 maunds 27 seers of outturn. This amount deducted from the total actual outturn, *viz.*, 232,018 maunds, leaves a balance of 209,764 maunds 13 seers, for exportation. No cotton is imported for consumption in the district.
Agra,	The actual yield in lbs. is 12,764,160, and assuming a consumption of 2,192,900 at 2lbs. per head of population, *viz.*, 1,096,450, as given in the Census of 1872, that will leave a balance for exportation of 10,571,260lbs., or 35,237 bales of 300lbs. each. Considering that Agra is the entrepôt for all Rajpootana cotton, that would raise the amount exported from Agra to a very high figure.
Furruckabad	States that in this district there is a very large consumption of English cloths, and the consumption of native-made cloth falls, in consequence, below 2 lbs. per head. Cotton, however, is imported into the district from Agra and elsewhere. No octroi duty is charged on it, so the actual amount that entered the city is unknown, but it is estimated that between 3,000 and 2,000 maunds are imported yearly.
Mynpoory,	The Assistant Collector in his statement states that, taking the population roughly at 755,000 souls, there will be required 1,510,000lbs. of cotton, according to the 2lbs. per head theory, to clothe them. But from enquiries made by him, it appears that of the cotton raised, a lesser amount is made into clothes *in the district*, while, counting in the cotton expended on the native cloth imported from Cawnpore, Furruckabad and elsewhere, a greater amount is required for the wants of the district. He first estimates the European cloth item and the children under 5 years who require no clothes. These stand respectively at 40 and 5 per cent. Of the 55 per cent. remaining, 35 are clothed by the cloth made in the district from district cotton, and 20 by imported native cloth. Allowing 4lbs. of cotton per head as the rate of consumption, he has— 264,250 heads × 4lbs. = 1,057,000lbs. district cotton.

District.	Reply.
Mynpoory—(*concld.*)	151,000 heads × 4lbs. = 604,000lbs. imported cloth cotton ;—that is to say, that out of actual outturn of 2,122, 978lbs., 1,057,000 is made into cloth in the district, 1,065,978 are exported, 604,000lbs. returning in the imported cloth = 1,661,000lbs. require to clothe the district, and 461,978lbs. net export. With regard to the Assistant Collector's remarks, the Collector of Mynpoory observes that he is not satisfied that sufficient grounds exist to set aside the former estimate of cotton required for home consumption, and at one swoop, by raising it from 2 seers to 4 seers per head, to double it all round. By Assistant Collector's proposition, 55 per cent. of the total population of 755,000 wear country-made cloth. This gives, at 4lbs. per head, 415,250 × 4 = 1,661,000lbs. 5 per cent. of the population are calculated as children who wear no clothes, and are consequently excluded, and 40 per cent. use English cloth. The latter gives souls 302,000 × 4 = 1,208,000lbs., for he supposes it takes as much cotton to make English as native cloth. The raw material raised being 2,122,978lbs., and the amount required to clothe the population being 1,661,000 + 1,208,000, or 2,869,000 lbs., the district would consume 746,022lbs. more than it produces. This result, he thinks, can hardly be depended on. Taking the population at 755,000, and allowing 2lbs. all round for clothing them, there will be a total consumption required to supply both native and Europe cloth of 1,510,000lbs., which, deducted from the outturn as above, would leave a balance in favour of the district of 612,978lbs., which he thinks somewhat nearer the right figure.
Etawah,	States that this district exports a large amount of cotton after providing for its own wants. The great bulk of the cotton exported is sent by road to Cawnpore. A considerable quantity is also sent by rail to Calcutta and by river to Mirzapore. A large amount grown in Gwalior is exported from Etawah, and a considerable quantity is brought from Jaloun to Oraie. As cotton merchants purchase the cotton from brokers who deal either directly with the growers, or, as is most common, buy it from small itinerating traders, it is impossible to say with any degree of accuracy how much of the cotton exported is actually grown in the district. The estimate of consumption per head given by Luchmun Sing, *viz.*, 2lbs., would leave a surplus of upwards of 50,000 maunds for export, after providing for the wants of the population of the district. This is undoubtedly much in excess of the quantity exported, and shows that the estimate of 2lbs. per head is too low.

District.	Reply.
Etah, ...	The actual yield in lbs. is 6,284,400, and assuming the Government rating to be correct, and 2lbs. to represent the amount of cotton a man wears in the year in the shape of cotton fabric, the account will be 6,284,400lbs, *minus* twice the population, or 1,401,376lbs., leaving 4,823,024lbs. of cotton for export—in other words, about one-fourth is retained, and three-fourths exported. The Collector thinks that 2lbs. is a very low figure, and would be inclined to put the expenditure at 4lbs. per man.
	Jhansie Division.
Jaloun,	States that the total outturn provides above 6lbs. per head. In the last year it amounted to 877,200 lbs., which allowed less than 3lbs. per head. The amount exported would (allowing at 2lbs. per head) thus amount to 1,790,296lbs., which at the present rate for best cleaned cotton (Rs. 33-7-0 per maund of 80lbs.) would give Rs. 3,00,713-12-6. The registration of cotton at Calpee bridge gave, in 1872, the following results:—
	Mds. s. Rs. Export from Calpee, ... 15,120 21, value 2,35,633 Imports cotton cleaned, 443 7 ,, 10,649 River traffic on cotton from Agra towards Mirzapore and Calcutta, 117,355 0 ,, 19,28,459 Total, ... Rs. 21,74,741
	The exports from Calpee include cotton passing through from surrounding Native States. The actual export of the district cotton cannot be given.
Jhansie,	The population of the district being 320,008, the estimated consumption of country cotton at 2lbs. per head gives a total of 640,016lbs. for home consumption. Deducting this amount from the actual produce, *viz.*, 701,920lbs. in the year under report, there is a balance of 61,904lbs. for export. In the towns and amongst the better classes of zemindars there is a large consumption of English cloth, and it is quite possible that the actual consumption of country cotton does not amount to 2lbs. per head of the population. But there are no means available for correctly ascertaining the quantity of English cloth imported and sold annually. There is a considerable export trade at Mow, Rampore, Erich, and the other towns of the district, in the various kinds of country cloths, and country cloth is also brought to the towns from the neighbouring States and districts for sale here. But no cotton is imported to supply the wants of local consumers. There can be no doubt that the district raises more than enough cotton to clothe its own population.

District.	Reply.
Lullutpore, ...	States that the average produce of cotton is ... ... 49,989lbs. Amount at 2 lbs. per head of the population (as per Census of 1872), ... 425,256lbs. Hence it will be observed that this district does not raise enough cotton to clothe its own population. No cotton is exported from the district, but imports are usually made from Jhansie, Jaloun and Majoulie (Gwalior State), and sold in the Lullutpore market.
	Allahabad Division.
Cawnpore,	The amount of cleaned cotton in this district falls at the rate of 2·59lbs. per head of the population, which numbers 1,174,554 souls. At 2lbs. per head the requirement for consumption will amount to 2,349,108lbs., leaving 696,142lbs. for exportation.
Futtehpore,	Of the quantity of cotton which the district produces, about half is exported, and half is retained for local consumption, which gives a little above ¾lb. per head of the population.
Banda,	After deducting 1,392,886lbs. the amount retained for local consumption at 2lbs. per head of the population (although Collector is not by any means sure that it is a correct estimate, as much depends on the amount of cotton used for wadded quilts and the general use of blankets, or otherwise, instead of quilts) there remains 2,514,660lbs. for exportation. Country cloth has been somewhat cheaper, but there are no correct statistics of price, as country cloth varies so much in length, breadth, and consistency. Country cloth is in greater demand than English cotton cloth in the rural districts. Cotton is fast leaving the district by the Jumna from Chilla Tara Ghât and from Rajapore.
Allahabad,	States that the population of this district, according to the last Census, numbers 1,382,286, which at 2lbs. per head would require 2,764,572lbs. for clothing, whereas the outturn being equivalent to 790,834lbs., there is a deficit of 1,973,738lbs. before the amount require to provide clothing for the district is reached. Though small quantities of cotton are exported, there is no doubt that enough cotton is not grown to provide for the wants of the district, which are met by importation from other districts.
Humeerpore,	States that the cotton in this district is chiefly exported. The growers retain a small quantity for their own use, and it is also sold to a small extent for local consumption, but the cotton so kept, or sold, is sufficient to clothe a very small portion of the population. The majority make use of the English piece-goods. In the first place, the great

District.	Reply.
	increase in the number of shops for the sale of the English piece-goods indicates the existence of a demand for those articles in preference to the country cloth ; and, in the next place, the condition of the weavers themselves shows the certain decline of their trade. In all the places which were visited by the Collector during his tour, he has been told that a weaver now would not take to his loom if he could find any other work, which appears, therefore, to be more remunerative than his hereditary calling. The actual outturn of cotton in 1872 was 1,565,100lbs., of which nearly four-fifths are exported. There are left, therefore, 313,020lbs. for local consumption. This, at 2lbs. per head, for a population of 527,535 souls, falls short by 742,050lbs. The district thus exports its cotton without providing for its requirements; and this export, the Collector believes, is to be ascribed to the change that has taken place in the way of a taste of the people for finer clothes.
Jounpore,	States that this is not a cotton producing district, and the little that it raises is quite insufficient for the requirements of the population: this want is supplied by imports from the western districts, *viz.*, Banda, Cawnpore, &c., and the Rewah State.
	Benares Division.
Goruckpore,	States that the District of Goruckpore does not raise sufficient cotton to clothe its population. Taking its outturn for this year at 33,660lbs., and the local consumption at 2lbs. per head of the population as 3,967,632lbs., a deficiency of 3,933,972lbs. is shown.
Bustee,	It is evident at a glance, from the following figures, that the local outturn is totally inadequate to the wants of the population. The district, in fact, is not a cotton-growing one, and imports cotton in large quantities. *Actual produce of cotton in* 1872-73. 975 lbs. — *Amount at* 2lbs. *per head of the population*: 2,975,144lbs.
Azimgurh,	Observes that Azimgurh is not a cotton-growing district. Cotton is only grown here and there, intermixed with urhur, and the total area under such cultivation does not exceed 244 acres in the whole district. District wants are supplied by importations of country cotton and English piece-goods and thread. The local *tussur* cloth pieces are manufactured from an admixture of English thread and silk.
Mirzapore,	States that of the cotton imported in this district some 6,100 maunds are said to be consumed besides the local crop.
Benares, Ghazeepore,	Reports not yet received.

Comparative Statement of area and actual outturn of the Cotton Crop in the Districts of the North-Western Provinces for 1872-73.

Division.	District.	*Area and estimated outturn for* 1872-73.		Outturn per acre.	*Actuals for* 1872-73.		Outturn in cleaned cotton in mds.	Remarks.
		Acres.	Maunds.		Acres.	Maunds.		
Meerut.	Dehra Doon, ...	75	38	0 20 4	75	35	0 18 10	No remarks. Report dated 3rd April, 1873.
	Saharunpore, ...	29,999	37,009	1 9 5	30,136	39,085	1 11 14	Although there is an increase on the total, yet the crop in several Tehseelees was much damaged by the heavy rains. The increase is only in Tehseelee Saharunpore, where the crop was favorable. Report dated 27th March, 1873.
	Moozuffernuggur,...	30,624	39,426	1 11 7	30,623	39,725	1 11 14	No remarks. Report dated 3rd April, 1873.
	Meerut, ...	65,035	79,041	1 8 9	65,035	78,896	1 8 8	There is a good deal of guess-work, the Collector states, in the preparation of the return, which cannot be looked upon as quite trustworthy, though perhaps it may be accepted as shewing a rough approximation to facts. Report dated 29th March, 1873.

Comparative Statement of area and actual outturn of the Cotton Crop in the Districts of the North-Western Provinces for 1872-73—(continued.)

Division.	Districts.	*Area and estimated outturn for* 1872-73. Acres.	Maunds.	Outturn per acre.	*Actuals for* 1872-73. Acres.	Maunds.	Outturn in cleaned cotton in mds.	Remarks.
Meerut—*concld.*	Boolundshuhur, ...	64,887	1,08,957	1 27 2	67,390	1,10,072	1 25 3	No remarks. Report dated 21st March, 1873.
	Allygurh, ...	85,587	84,744	0 39 9	85,587	80,758	0 37 12	The actual outturn of this year, on the whole, is better, and exceeds by 22,406 maunds that of the last year. Report dated 26th March, 1873.
	Total, ...	2,76,207	3,49,215	1 10 9	2,78,846	3,48,571	1 10 0	
Kumaon	Kumaon, ...	255	255	1 0 0	255	255	1 0 0	No Remarks. Report dated 28th March, 1873.
	Gurhwal, ...	...	...	...	...	...	...	
	Terai Pergunnahs,	3,343	1,943	0 23 3	3,343	1,923	0 23 0	No remarks. Report dated 10th April, 1873.
	Total, ...	3,598	2,198	0 24 6	3,598	2,178	0 24 3	
	Bijnour, ...	34,608	26,906	0 31 1	34,123	23,477	0 27 8	It will be seen that there has been a larger area under cotton, and also a larger yield. Report dated 4th April, 1873.

Rohilkhund.	Moradabad,	...	50,194	34,496	0 27 7	44,829	29,688	0 26 8	The decrease is attributed to excess of rain. Report dated 26th February, 1873.
	Budaon,	...	39,711	21,293	0 21 7	57,710	32,586	0 22 9	This year has been undoubtedly, generally speaking, favorable to the crop. September and October were dry months, and cotton that had not suffered previously turned out well. Report dated 29th March, 1873.
	Bareilly,	...	16,471	10,701	0 25 15	27,420	13,507	0 19 11	The crop throughout the district was affected to a certain extent by the severity of the monsoons towards its commencement, and again by the scantiness of the fall towards its close, when rain was much wanted. Report dated 25th April, 1873.
	Shahjehanpore,	...	10,718	3,733	0 13 14	10,718	4,765	0 17 12	No remarks. Report dated 5th April, 1873.
	Total,	...	1,51,702	97,129	0 25 10	1,74,800	1,04,023	0 23 13	

Comparative Statement of area and actual outturn of the Cotton Crop in the Districts of the North-Western Provinces for 1872-73—(continued.)

Division.	District.	*Area and estimated outturn for* 1872-73. Acres.	Maunds.	Outturn per acre.	*Actuals for* 1872-73. Acres.	Maunds.	Outturn in cleaned cotton in mds.	Remarks.
Agra.	Muttra, ...	1,30,535	2,27,083	1 29 9	1,34,070	2,32,018	1 29 3	This year, as last, the Government demand due on the autumn harvest was paid principally from the proceeds of this crop; the season was a favorable one, and the outturn good. Report dated 31st March, 1873.
	Agra, ...	1,30,671	1,52,455	1 6 10	1,38,024	1,59,552	1 6 3	It will be seen that the area actually under cultivation exceeded the estimate by about 8,000 acres, but the guess made at the outset as to produce came very near the mark estimated, proving to be about 1 maund 6 seers per acre. Report dated 8th April, 1873.
	Furruckabad, ...	22,192	12,986	0 25 3	22,192	15,159	0 27 5	In Board's statement submitted to Government with No. 57, dated 17th January, 1873, 20,815 acres were entered as under the crop, and the outturn was estimated at 12,129 maunds. A mistake was made in the Collector's office, which has now been corrected. The season has been a favorable one for the cotton crop, the actual being considerably higher than that estimated. Report dated 26th March, 1873.
	Mynpoory, ...	33,961	27,422	0 32 4	34,607	25,890	0 30 0	The year has been a favorable one. This crop has been the saving of the agriculturists during the cold weather, other rainy crops having proved unusually light. Report dated 31st March, 1873.

Agra—(*concld.*)	Etawah,	...	65,080	77,131	1 7 6	65,080	67,200	1 1 5	As all the sowings had been completed when the estimate was submitted in November last, there is no difference in the area. The actual outturn is, however, 10,000 maunds less than what was estimated. The crop suffered to some extent from excessive rain, more especially in low-lying and canal-irrigated villages. The Collector is of opinion that the yield is somewhat under-estimated. Report dated 17th March, 1873.
	Etah,	...	42,195	91,000	2 7 3	42,458	93,555	2 8 0	The year has been a most favorable one for the cotton crop. A full harvest was gathered. Indeed, the excellence of the crop was a by-word among the people, as the staple edible crops of the khurreef were to a great extent a failure, and the Collector heard the people all round say that they had paid their mal-goozaree from their cotton. Report dated 10th April, 1873.
	Total,	...	4,24,634	5,88,077	1 15 6	4,36,431	5,93,374	1 14 6	
Jhansie.	Jaloun,	...	54,044	38,980	0 28 13	54,152	31,667	0 23 6	The decrease is owing to the high average of rain-fall in the months of July and August, 1872. Report dated 27th March, 1873.
	Jhansie,	...	22,912	8,658	0 15 1	20,737	8,774	0 16 15	The rains of 1872 were unfavorable, and destroyed a considerable portion of the seed.
	Lullutpore,	...	1,576	457	0 11 9	1,781	603	0 13 9	The crop promised well, (Report dated 19th March, 1873); but late rains injured the blossoms. Had it not been for this injury the outturn would have much exceeded the estimate. Report dated 27th March, 1873.
	Total,	...	78,532	48,095	0 24 7	76,670	41,044	0 21 6	

Comparative Statement of area and actual outturn of the Cotton Crop in the Districts of the North-Western Provinces for 1872-73—(continued.)

Division.	District.	*Area and estimated outturn for 1872-73.* Acres.	Maunds.	Outturn per acre.	*Actuals for 1872-73.* Acres.	Maunds.	Outturn in cleaned cotton in mds.	Remarks.
Allahabad.	Cawnpore, ...	67,532	37,729	0 22 5	67,532	37,125	0 22 0	The outturn has very nearly come up to the estimate. Report dated 19th April, 1873.
	Futtehpore, ...	24,501	10,954	0 17 14	24,069	10,081	0 16 12	There is a slight difference in the actual as compared with the estimate, which is attributable to the untimely cessation of the rains towards the close of the monsoon. Report dated 29th March, 1873.
	Banda, ...	1,00,845	48,745	0 19 5	99,988	47,653	0 19 1	The Collector believes the statement to be incorrect. It may, he states, be approximately correct as to the area under cultivation, but there are, in his opinion, no correct data on which to come to a conclusion regarding the actual produce in cleaned cotton. The crop in the low lands was much injured by excessive rain in July and August, but in the high lands it was much better than usual, owing to the increased amount of moisture. Report dated 26th March, 1873.
	Allahabad, ...	27,666	14,225	0 20 9	27,138	9,611	0 14 3	The decrease is attributable to the heavy rains at the commencement of the season injuring the blossoms. Report dated 29th March, 1873.

BENARES.	Humeerpore, ...	55,455	16,126	0 11 10	53,978	17,390	0 12 14	There has been an increase both in the area and outturn of cotton as compared with those of the year preceding. Report dated 2nd April, 1873.
	Jounpore, ...	1,531	307	0 8 0	1,542	279	0 7 3	Owing to the inundation of September, 1871, the crop suffered much, and the outturn was therefore inconsiderable. Report dated 4th April, 1873.
	Total, ...	2,77,530	1,28,086	0 18 7	2,74,247	1,22,139	0 17 13	
	Goruckpore, ...	3,545	462	0 5 3	3,442	408	0 4 12	The actual is less than the estimated outturn, owing to the heavy rains of last year. There is hardly any cotton grown in the district, and the outturn can have no relation to the area, as cotton is never sown unmixed with urhur or some other crop in the district. Report dated 5th March, 1873.
	Bustee, ...	66	19	0 11 3	66	12	0 7 4	It appears that the dread of heavy rains made the cultivators cautious of sowing much cotton, and what was grown did, in fact, suffer greatly from excessive moisture and flooding. Report dated 14th April, 1873.
	Azimgurh, ...	272	25	0 3 4	244	86	0 14 2	This is not a cotton-growing district ; cotton is only sown here and there, interspersed with urhur. Report dated 4th April, 1873.

Comparative Statement of area and actual outturn of the Cotton Crop in the districts of the North-Western Provinces for 1872-73.—(concluded.)

Division.	District.	*Area and estimated outturn for* 1872-73. Acres.	Maunds.	Outturn per acre.	*Actuals for* 1872-73. Acres.	Maunds.	Outturn in cleaned cotton in mds.	Remarks.
Benares—(*concld.*)	Mirzapore, ...	10,575	6,163	0 23 4	10,575	6,142	0 23 4	Want of rain has lightened the outturn. Report dated 29th March, 1873.
	Benares, ...	4,991	1,187	0 9 8	4,991	1,187	0 9 8	No report having yet been received from the Collector, the estimates for 1872-73 have been entered in the last three columns against this district.
	Ghazeepore, ...	2,101	467	0 8 14	2,101	467	0 8 14	No report having yet been received from the Collector, the estimates for 1872-73 have been entered in the last three columns against this district.
	Total, ...	21,550	8,323	0 15 7	21,419	8,302	0 11 12	
	Grand Total, ...	12,33,753	12,21,123	0 39 7	12,66,011	12,19,631	0 38 8	
	Deduct increase now made in Furruckabad, ...	1,377	857	...	...	...	...	
	As in the report of the estimated outturn, ...	12,32,376	12,20,266	0 39 10	...	...	...	

Board of Revenue, N.-W. P.:
Dated Allahabad, the 21st May, 1873.

E. C. BUCK,
Officiating Secretary.

2—*From* R. T. HOBART, ESQ., *Deputy Collector of Etah, to Secretary to the Board of Revenue, North-Western Provinces.* (No. 156).—*Dated Etah, the 10th April,* 1873.

I have the honour to acknowledge your Circular No. N., dated 4th February, 1873, and to submit herewith the prescribed table exhibiting the estimated and actual (so far as I can judge) outturn of cotton for the year 1872-73.

2. The year has been a most favorable one for the cotton crop—a full harvest was gathered. Indeed, the excellence of the crop was a by-word among the people, as the staple edible crops of the khurreef were to a great extent a failure, and I heard the people all round say that they had paid their malgoozaree from their cotton.

3. You request me to supply the information required in paragraph 7 of Government Order No. 738A., dated 21st may, 1872. I beg to refer to my letter No. 35, dated 20th July, 1872, in which I entered fully into the whole subject; I there endeavored to show that, taking rent and expenses of cultivation into account, also having regard to ruling prices, no man except a fool would cultivate this crop unless the average outturn of his cotton field per acre were from 2 to 2¼ maunds or more; and I tried to show that the experienced and sensible native farmers whom I had consulted suggested these figures for average outturn. I cannot improve on that latter, and time has only served to strengthen my belief in the figures quoted therein, so I would beg to insert paragraphs 3 to 21 of that letter to show the reasons for my faith.

4. This year I estimate the average outturn of Tehseels Etah and Kasgunge at 2¼ maunds per acre, and the average outturn of Tehseel Allygunge (making allowance for its generally inferior soil and returned outturn) at 2 maunds 1 seer per acre. This gives us an average of 2 maunds 8 seers 2 chittacks per acre for the district, and 6,284,400lbs. for the whole produce of the district. Assuming the Government rating to be correct, and 2lbs. to represent the amount of cotton a man wears in the shape of cotton fabric, the account will be

6,284,400lbs., *minus* twice the population, or 1,401,376lbs., leaving 483,024lbs. of cotton for export—in other words, about one-fourth is retained and three-fourths exported. I think 2lbs. is a very low figure, and would be inclined to put the expenditure at 4lbs. per man.

5. I have nothing new to say, and beg to insert the extract from my former letter above alluded to :—

"3. It appears to me that there is a very general error in these statements all through the provinces, and that those districts which have given the largest estimates are probably the nearest accuracy.

"4. The calculation for this district was 1 maund 39 seers, or (say) 2 maunds of cleaned cotton, for an average good season, and for last season I calculated that we lost one-third of our crop. My present calculation lead me to believe that I somewhat under-estimated an ordinary crop, and that 2 maunds 7 seers 5 chittacks, or (say) 2¼ maunds of cleaned cotton, may be safely assumed as a fair ordinary crop per acre, and that last year's outturn of cleaned cotton was probably about 1 maund 18 seers, and not 1 maund 12 seers, as assumed, to the acre.

Estimated outturn of cotton.

2¼ maunds is the average outturn per acre of cleaned cotton.

"5. The subject is an interesting and important one, and if I may trespass on the time of the Board, I will give, as briefly as I can, the mode of calculation which I have adopted. My figures are derived from information supplied me by practical farmers in the district, and chiefly from the information given by Raja Dilsookh Rai, the shrewdest and most successful landowner here, and who does not entertain any suspicion of a design to enhance his jumma from these enquiries.

Sources of information.

"6. Doomut chahee is the soil almost always chosen for cotton. It may be gowhanee, or mediate, or outlying land. The average rent-rate here is Rs. 2 per kuctha beegha and the average produce is from 1 to 1½

Date of calculation, soil.
Rent-rate.
Gross produce.
Proportion of seed to cleaned cotton.

maunds of kupas—say an average of 1 maund 10 seers. Roughly speaking, one-third of the kupas resolves itself into cleaned cotton and two-thirds becomes seed. For picking, one-tenth of the produce kupas is given to the women who pick the stuff, while the process of separating the cotton from the binola (or seed) costs 2 tukkas per 2½ seers, or about one rupee per maund of cleaned stuff. The average price of cotton taken from the ten years' tables recently prepared in this office is 2 seers 7 chittacks per rupee.

Cost of picking. Cost of cleaning. Average price of cleaned cotton and seed.

"7. It is also to be recollected that urhur or urind, or some other highish lentil, is sown in straight ridges in all cotton-fields. In the following calculations I assume that the cultivator has no cattle, that he rents his land and pays for all labour thereon. Allowance, such as is thought just, may be afterwards made for circumstances when the tenant keeps his own cattle. It may be considered, however, that labour on his own land is worth what it would fetch if employed elsewhere.

The value of intermixed crop to be taken into account.

"8. The cost of getting in the produce of *a kutcha beegah of* "*kupas*" will be as follows—

Cost of production of one kutcha beegah of kupas.

	Rs.	a.	p.
Rent (chahee doomut), ...	2	0	0
Seed, ...	0	1	0
Weeding (3 or 4 times,)	0	8	0
Ploughing and sowing twice at least, ...	0	6	0
Picking, ...	0	15	0*
Total,	3	14	0

* *Note.*—(This item is calculated as above explained in paragraph 6.) The yield of a kutcha beegah is about 1 maund 10 seers of kupas; the man who pick the cotton get one-tenth of the gross amount of the kupas as wages,—$\frac{1}{10}$th of the above 1 maund 10 seers=5 seers of kupas; while kupas sells at about Rs. 7-8 per maund; ∴ $\frac{1}{10}$th of the 1 maund 10 seers=5 seers of kupas at Rs. 7-8-0 per maund=annas 15. We have thus got 1 maund 10 seers of kupas as the ordinary produce of a kutcha beegah, and Rs. 3-14-0 the ordinary amount of the cost of its production.

"9. By the process of cleaning, we will get according to the one-third cotton and two-third seed calculations (cf. paragraph 6), 17 seers of cotton and 33 seers of seed from the above 1 maund 10 seers kupas to the kutcha beegah; cleaning costs, as explained in the same paragraph, one rupee per maund, ∴ the cleaning of this 17 seers of cleaned cotton at the rate of one rupee per maund for cleaning = 7 annas.

Cost of cleaning the cotton in a kutcha beegah at one rupee per maund.

"10. These 17 seers of cotton at the average of 2 seers 6 chittacks or 2 seers 7 chittacks per rupee will bring us in Rs. 7 nearly, while the 33 seers of seed at the rate of 31 to 33 seers per rupee will bring us in one rupee, or a total of Rs. 8 for both products, cleaned cotton and its seed.

Price which the cleaned cotton and its seed will fetch in the market.

"11. The cost therefore of production of the cotton and seed in the kutcha beegah is, Rs. 3 14 0
Of cleaning the cotton, ... 7 0 0
or a total of Rs.,... 4 5 0

Nett profits of a kutcha beegah and of an acre of cotton after all deductions.

	Rs.	a.	p.
Price realized, ...	8	0	0
Cost of production,	4	5	0
Nett profits, Rs.,...	3	11	0

while the value of produce at sale is Rs. 8. The nett profits will, therefore, be the price realized at sale, *minus* cost of production and cleaning, or Rs. 3-11-0; and as $5\frac{1}{4}$ kutcha beegahs go to the acre, Rs. 3-11-0 × $5\frac{1}{4}$ = Rs. 19-5-9, the nett profits of an acre of cotton plant.

"12. With cotton, as explained in paragraph 7, urhur or some other crop is invariably sown. There is no extra expense involved except in cutting and threshing it. The ordinary cost and produce, and market value of urhur in a kutcha beegah of kupas is as follows :—

Cost of production of the urhur sown in a kutcha beegah and an acre of cotton, and nett profit from both crops after all deductions.

Cost.	Rs.	a.	p.	*Produce.*	Rs.	a.	p.
Seed, ...	0	0	1	Crop, 1 md. 10 srs. at 27 seers 1 ch. per Re. =	1	13	6
Cutting, ...	0	2	0	Bhoosa, 2 mds., at 3 mds. per Re. =	0	10	0
Threshing, ...	0	3	0	Wood, 8 loads, at 1 anna per load =	0	8	0
Total, ...	0	5	1 (say 5 annas.)	Total, ...	2	15	6

∴ Rs. 2-15-6—5 annas + 5¼ = the value of urhur in an acre of kupas.
or „ 13-5-0, ∴ Rs. 19-5-9 nett profits of cotton and seed in an acre.
and „ 13-5-0 = ditto of intermixed urhur in ditto.

Or total Rs. 32-10-9 (say Rs. 32½) or the normal profits of an acre of cotton land as laid out in this district.

" 13. It is obvious that if wheat paid the cultivator better, he would sow wheat. As cotton is not a staple of life, the cultivator only sows it because its value in money is more than what he would derive from wheat. What the value of a wheat crop is I will now try to show.

" 14. Wheat is sown in good doomut, and has generally *til* or *surson* sown in stripes through it. The following is my account of the cost and value of the produce of a *kutcha beegah* of wheat and *surson* :—

Value of a *kutcha* beegah and of an acre of wheat and its intermixed crop.

	Cost. Rs.	a.	p.		*Produce.* Rs.	a.	p.
Rent	2	4	0	Wheat, 4 mds., at 20 srs. 11 chs. per rupee =	7	12	6
Seed	0	8	0	Bhoosa, 10 „ „ 3½ mds. „ =	3	0	0
Ploughing,	0	2	0				
Sowing,	0	2	0	Total Rs. ...	10	12	6
Watering,	2	0	0				
Weeding,	0	2	0				
Cutting,	0	3	0				
Threshing	1	0	0				
Total Rs....	6	5	0				

Rs. 10-12-6—Rs. 6-5-0—Rs. 4-7-6, the nett profit for Wheat per kutcha beegah.

Surson costs almost nothing for labour. Its produce may be set down as 10 seers per kutcha beegah ; its market price deduced from the tables is 19 seers 5 chittacks per rupee, ∴ 10 seers = 8 annas 6 pie. The nett profits of a kutcha beegah of wheat and *surson* are Rs. 4-7-6 + 8 annas 6 pie, or Rs. 5, and the nett profits of an acre of these crops will be Rs. 5-0-0 × 5¼, or Rs. 26-4-0.

" 15. The average holding of a cultivator is about three acres, or about 16 kutcha beegahs. Suppose the cultivator puts down nothing but wheat in his land, then accepting the above profits on an

Average holding of a cultivator ; his profits if wheat alone were sown.

acre of wheat as correct, Rs. 26-4-0, or the profit of an acre, Rs. 78-12-0, on 3 acres per annum, or about Rs. 6-8-0 a month. This is all he would have to sustain himself and his family, and provide against evil times, and pay interest to the mahajun. I do not think that he could well live on much less than this, particularly as his women-kind are, as a rule, more engaged in in-door work than on his land.

"16. From the above, it follows that the cultivation of cotton, with all its market and season risks, brings him in about Rs. 6 an acre more than wheat; and Rs. 6, or one-fifth more on the acre, is but a small inducement to cultivate a risky crop.

"17. The moral of all this is, that collected statistics and common sense show plainly that 2 maunds, or more, of cleaned cotton may be assumed as the very lowest average amount of produce to an acre at which the cultivation of cotton would be consistent with theory that the cultivator possesses ordinary reasoning powers.

Least quantity of production per acre, when cultivation is compatible with reason.

"18. I see that the estimates of some of the neighbouring districts are cast at 18 seers of cleaned cotton per acre; in others the estimate goes down to 10 seers. Possibly, the practice of cultivation is different, and foreign crops more largely intermixed with cotton in those districts, or the failure of the crop has been much greater there than here.

Reported produce in the neighbouring districts.

"19. Take my figures as to the cost of production and the price of staple, and 18 seers as the produce in cleaned cotton. The expenses will be the same except the picking and cleaning; picking, according to the above account, will be as follows:—

Data; cleaned cotton is one-third in weight of the kupas from which it is extracted; the kupas of this 18 seers will have been 54 seers. Again, the picker gets one-tenth of kupas for picking, or $\frac{54}{10}$, or 5 seers 6 chittacks; kupas sells at

Rs. 7-8-0 per maund ; ∴ 5 seers—6 chittacks = 12 annas ; cleaning costs 1 rupee per maund ; ∴ the cleaning of 18 seers = 7 annas.

According to this account :—

	Rs.	a.	p.
Rent, ...	... 2	0	0
Seed, ...	... 0	1	0
Weeding, ...	... 0	8	0
Ploughing and sowing,	... 0	6	0
or total Rs.	... 2	15	0

per kutcha beegah × Rs. 5½ = Rs. 15-6-9 per acre.

Add 12 annas for picking and 7 annas for cleaning, and the total will be Rs. 16 9-9.

	Rs.	a.	p.
The price of production of this 18 seers of cotton in this acre of land—18 seers of cotton, at 2 seers 7 chittacks per rupee ...	= 7	6	0
36 seers binoula, at 31 seers to 33 seers per rupee ...	= 1	2	0
Total, Rs. ...	8	8	0

The cultivator would thus pay Rs. 16-9-9 and receive Rs. 8-8-0 or spend Rs. 2 for every one he gets from cotton cultivation. Take the whole account—

Rs.	a.	p.	
13	5	0	nett profits of urhur (c f. para. 12.)
8	8	0	price of cotton and seed.
Rs. 21	13	0	

Deduct Rs. 16-9-9, price of cotton cultivation, and Rs. 5-5-3 will be the cultivator's profits per acre. But he will be cultivating cotton at a suicidal loss without any object.

" 20. I cannot reconcile my figures with those of neighbouring districts. I think that my own figure has been pitched too low, and that this error is universal.

" 21. Since writing the above, I have seen the Revenue Administration Report of the Board of Revenue for 1870-71, where, at page 10, Section 13, the results of the experiments in the Boolundshuhur Cotton Farm are given. I there see that country cotton yielded 183lbs. to the acre, or about 2 maunds 10 seers or 2 maunds 9 seers of cleaned cotton to the acre. The result approximates pretty closely to my estimate of 2 maunds 7 seers 5 chittacks of cleaned cotton per acre, and confirms me in my belief, although the proportion of cleaned cotton to kupas is only about one-fourth, and not one-third as I estimate."

3.—*From the* SECRETARY TO GOVERNMENT, *North-Western Provinces, to the* OFFICIATING SECRETARY TO BOARD OF REVENUE, *North-Western Provinces,* (*No.* 1379 *A.*)—*Dated Nynee Tal, the 3rd July,* 1873.

I am directed to acknowledge the receipt of your letter No. 557, dated 21st May, 1873, being the report on the outturn of the cotton crop in the North-Western Provinces for 1872-73, and in reply to communicate the following remarks and orders.

2. The actual area under cotton during the year is put at 1,266,011 acres against an estimate of 1,233,753, being an increase of 32,258 acres. As the estimate, however, is framed after the cotton has been sown, the area shewn is capable of exact ascertainment; and if the return be accurately prepared, the only difference, apart from error or mistake between the estimated and actual area, can arise from land thrown out of cultivation after being sown, or where the crop has failed. The alteration in the area therefore, as now shown, can only be taken as a correction of that previously given.

3. In a few districts the crop suffered from excessive rain, but, on the whole, the yield was good as compared with preceding years. The outturn was estimated at 1,221,123 maunds of cleaned cotton, or an average of $39\frac{7}{16}$ seers per acre, and the actual outturn is reported as 1,219,631 maunds, or an average of $38\frac{1}{2}$ seers. The increase over the actuals of 1871-72 is 397,206 maunds. The following table shows the area and outturn for the last seven years:—

Year.	Area (in acres) cultivated.	Outturn in lbs.
1865-66, ...	895,102	62,663,280
1866-67, ...	1,112,677	85,684,920
1867-68, ...	1,227,726	57,875,120
1868-69, ...	865,283	44,137,840
1869-70, ...	1,160,898	37,104,160
1870-71, ...	1,248,306	76,387,600
1871-72, ...	1,077,358	65,794,000
1872-73, ...	1,266,011	97,570,480

4. The price-currents in the *Gazette* show an average price of Rs. 16-11-4 and Rs. 15-0-5 per maund for the years 1865-66 and 1866-67. In 1870-71 the price rose to Rs. 19-15-9, and in 1871-72 to Rs. 20-10-11. The average prices from 1st April, 1872, to 1st July, which mainly affect the breadth of area sown, were as follows:—

		Rs.	a.	p.
1st April,	... ...	21	10	5
1st May,	... ...	21	13	4
1st June,	... ...	20	10	1
1st July,	... ...	22	3	3

5. The Board's remarks on the different estimates of produce per acre in different districts are important. There has always been, ever since the subject first attracted the attention of the Board, many years ago, an extraordinary variation in these returns. It is from many causes a difficult matter to hazard an estimate of the yield of cotton. The prospects vary exceedingly according to the weather, and even after flowering they change from week to week. The variations of district estimates are exemplified by Agra, where, by the consent of the Tehseeldars throughout the district, 100lbs. per acre of clean cotton would be a moderate return; while in Banda, on the other hand, a cotton-growing district (including the well-known cotton pergunnah of Beergurh) 40lbs. is regarded as rather high. It is to be noticed, however, that widely as districts differ from one another in this respect, there is ordinarily no such great variation in the interior estimates of the same district, and that the Tehseel averages do bear a general resemblance to each other. An average seems to become established in a district, anything above or below which, is regarded with suspicion; and Tehseelee and district estimates are thus apt to become more or less stereotyped.

6. Apart, however, from these considerations, there is a real and great divergence of opinion as to the normal yield. Mr. Hobart, the advocate of the extreme yield, holds that a return of less than 2 or 2½ maunds an acre would not repay

the expense of cultivation; whereas, in Banda, a quarter of a maund is thought fair. The question is complicated again by the general practice of sowing cotton as an adjunct to other crops, which materially lowers the outturn without affecting the area.

7. But the Lieutenant-Governor believes that Mr. Hobart's estimate is extravagant. In exceptionally good and well-manured land Rajah Dilsookh Rai may secure a return exceeding 2 maunds: but His Honor is satisfied that even 100lbs. is considerably above the average, and that one maund or (say) 80lbs., of clean cotton is a high general estimate. Indeed, Sir W. Muir would place the average for the whole North-Western Provinces considerably lower. In some districts, like Boolundshuhur, Allygurh and Agra, the outturn may perhaps in favorable years exceed this; but certainly in most other parts of the country it is lower, in many, very much so. Taking this year's crop as decidedly above the average the Lieutenant-Governor accepts the general average of (say) 39 seers as a full and fair estimate of clean cotton per acre.

8. The staple, so far as domestic production is concerned, has been good. The Lieutenant-Governor accepts the opinion of the firm of Messrs. Schlaepfer, Putz and Co., on this point. Mr. Gilmore's statement to the contrary may perhaps apply to the Rajpootana and Central India produce, regarding which His Honor has no information.

9. The estimate of local consumption is based on grounds extremely difficult to test. The quantity consumed in clothing varies with climate, and is no doubt greater in the northern districts than where the temperature necessitates less covering. The same is found to be the case in Jails. It is also to be noted that consumption will be greater in districts where cotton is grown, and where it is cheap and an article of home production, than in parts where it has to be imported, and is consequently dearer and more difficult to procure. It also happens that in these Provinces, the districts where the climate requires a heavier and more substantial clothing are

as a rule, the producing districts. On all these grounds, it is quite possible that an estimate, which, like that of 2lbs. per head, is questioned in some districts as low, might elsewhere, as in the Benares Division, where the cultivation of cotton is almost unknown, be considerably too high.

10. It is shewn in the Board's report that if the 2lbs. estimate be accepted, nearly one-half of the districts in the province do not produce a sufficient quantity of cotton to clothe their own population, and that the net surplus remaining for exportation in the year under review, a year above the average, is only 37,204,750lbs. The Board would fix the average consumption at 1½lbs. per head, and considering that the quantity which went to Calcutta from the North-Western Provinces alone in 1871-72 can hardly have been less than 50,000,000lbs. in each year, they think that the outturn must have been under-rated. But this estimate is affected by the imports from Rajpootana, Central India and Bundelkhund, and it is therefore extremely difficult to check it by any data of home produce and consumption. Moreover, cotton goes to Oudh and Nepal, and to a vast population in Upper Bengal, as well as to Calcutta. Our figures and deductions from domestic growth and consumption must, under these circumstances, be, to a great extent, guesses, unless we could obtain similar returns from all the Native States lying north and west of these Provinces, where cotton is grown.

11. In conclusion, I am to thank the Board for their careful and interesting report, and to request that the various considerations above adverted to may be kept in view in estimating the yield, consumption, and export of the coming season.

Art. XXX.

1.—DISCONTINUANCE OF EXPERIMENTS FOR CINCHONA CULTIVATION IN THE N.-W. P., BY THE SUPDT. BOTANICAL GARDENS, N.-W. P.

For several consecutive years Cinchona cultivation has been carried on in the Dhoons and Kohistan of the North-West Provinces, or from altitudes of 2,500 feet above the level of the sea up to 6,500 feet, and in all localities it has failed. It has been tried at Chundwallah and other localities in the Dehra Dhoon at 2,500; at Chejouri in Gurhwal at an altitude of 4,500; at Mussoorie, altitude 6,500. In the Babur Kumaon, altitude 2,000; at Hawul Baugh in Kumaon at an altitude of 4,500; at Ayar Toli and Raneekhet, altitude 6,000; and at Urkulli, altitude 6,500 to 7,000 feet. In all these localities, barring the Babur of Kumaon, the plants progressed during the hot weather and rains. In the cold weather it was deemed necessary to protect them from the frost, and this was done for three years, and until many of the plants had attained a height of from 4½ to 6 feet. These, with many others ranging from 2½ to 3 feet, were then left uncovered during the cold weather, and the result was the destruction of every plant in all the localities mentioned. I, too, have carefully watched the experiment carried on in the Kohistan of the Punjab in the Kangra Valley, by Major Lees and others, assisted by a practical Scotch gardener who had studied in Ceylon the cultivation of the plant, first at Quito, at an altitude of 4,500, and then at Bowarnah, at an altitude of 4,000 feet, where they have been equally unsuccessful; all the plants planted out, many of them four and five feet in height, having been cut down by the frost in the cold weather. At Raneekhet, plants of the *Cinchona succirubra* species, from four to five feet in height, were also cut down, even though partially protected, in a similar manner to those in the Dehra Dhoon, &c. This, therefore, shows that the plant is not at all fitted for the Dhoons or Kohistan of the North-West Provinces or Punjab. To rear the plant—particularly the species *Cinchona succirubra* and *Cinchona officinalis*—there is no difficulty, and at the present

moment there are at Hawul Baugh upwards of 700 plants, under glass, in a thriving condition. But these plants are of no practical use, as during the extensive trials which they have received for several consecutive years all have been destroyed by the frost during the cold season. To continue the growth of the plant as an experiment, in view to the cultivation for economic purposes, would be a mistake, and the time, therefore, has come to close the experiment, which has been carried on with the utmost care, labor, and attention, and to declare that the Dhoons and Kohistan of the North-West Provinces and Punjab are not fitted for the cultivation of Cinchona plants for commercial purposes.

2.—*From the* SECRETARY TO GOVERNMENT, *North-Western Provinces, to the* SECRETARY TO THE GOVERNMENT *of India, Department of Agriculture, Revenue and Commerce, (No* 278*).—Dated Allahabad, the* 13*th September*, 1873.

IN continuation of correspondence ending with your No. 367, dated the 19th August, 1872, I am directed to forward, for the information of His Excellency the Governor-General in Council, copy of a memorandum by the Superintendent, Botanical Gardens, North-Western Provinces, on Cinchona cultivation in the North-Western Provinces.

2. During the last four or five years, experiments in the cultivation of the Cinchona plant have been prosecuted by this Government in every kind of situation the climate or altitude of which promised fair results. An establishment has been sanctioned for the special purpose of attending to the Cinchona cultivation, and every chance of success has been given to the trial. But the experiments have all failed, and the Lieutenant-Governor has been reluctantly forced to the same conclusion as is now arrived at by Dr. Jameson, *viz.*, that the climate of Upper India is not suitable to the growth of the plant; it can be reared under proper shelter, but if exposed to the open air it is invariably struck by the frost and dies. Under these circumstances, it would be a mere waste of the means of Government to continue the experiment.

Art. XXXI.

ANNUAL REPORT ON GOVERNMENT GARDENS N.-W. P., 1872-73.

1.—*From* W. JAMESON, SURJEON-MAJOR, *Superintendent, Botanical Gardens, North-Western Provinces, to* C. A. ELLIOTT, ESQ., *Secretary to Government, North-Western Provinces,* (*No.* 90).—*Dated Saharunpore, the* 10*th May,* 1873.

I HAVE the honor to submit, for the information of the Hon'ble the Lieutenant-Governor, detailed statements showing the work that has been done in the gardens during the last year, or from 1st April, 1872, to 31st March, 1873.

2. During the year 37,393 fruit trees, 156,766 timber trees and flowering shrubs, and 5,530 parcels of seeds have been distributed.

3. This shews a considerable increase on the previous year, thus.:—

	Fruit trees.	Flowering shrubs.	Parcels of seeds.
1871-72 ...	35,960	147,963	3,550
1872-73 ...	37,393	156,766	5,530

4. To almost every Department of the State assistance in the form of plants and seeds has been given.—Appendix No. 1.

5. To the Medical Department a large supply of medical stores, *viz* :—

Extract of Hyoscyamus.	Dried leaves of Hyoscyamus.	Atees Tubers, Aconitum Heterophyllum.	Oak bark.	Kamaila powder.
lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.
207 0	224 0	1,409 8	148 0	64 0

has been, as per detailed statement No. 2, furnished.

6. To the Canal Department 2,675 parcels, or upwards of 4¾ tons of seeds have been forwarded.

7. To the Government Gardens, Calcutta, 16 maunds, or upwards of half a ton of teak seeds have been forwarded, to form an extensive plantation of teak in Bengal. These seeds were all collected from trees planted in the gardens and station from 1830 to 1845, many of which are now from 50 to 70 feet in height and from 5 to 9 feet in circumference, with fine compact wood, shewing how well this timber tree is adapted to this part of the country.

8. To the cantonments of Meerut, Umballah, Landour, Roorkee, &c., large numbers of timber trees and flowering shrubs have been supplied.

9. The cemeteries and church-yards of Umballah and Meerut have also received numbers of ornamental trees and shrubs.

10. To Her Majesty's Secretary of State for India, through Dr. Forbes Watson, 58 large parcels of seeds have been transmitted by pattern post.—See Appendix No. 3.

11. To soldiers' gardens 773 flower shrubs and 355 parcels of seeds have been distributed.

12. To the Landour Sanitarium upwards of 700 timber trees have been made over to Colonel Angelo, the commandant, to clothe the barren mountains of the station.

13. To the various public gardens, as Delhi, Jaipore, Bangalore, Sattara, &c., supplies of fruit trees, flowering shrubs, seeds, &c., have been forwarded. These few details, and which might greatly be extended, shew the large amount of work done by the gardens.—See Appendix No. 1.

Experiments made during the Season.

14. *Rhea fibre machines.*—The most important was that of the Rhea plant.

15. For 2½ years the Rhea plant "Bohmeria nevia" has now been cultivated at Saharunpore, and there are now upwards of 35 acres covered with it, and yielding green stems at the rate of about 2½ tons per acre per crop.

16. In August last, Colonel Hyde, Mintmaster, was deputed to examine the machines entered at Saharunpore to compete for the great prize of £5,000, given by His Excellency the Late Viceroy the Earl of Mayo.

17. Two machines had been entered—one by Mr. Matthews, of Glasgow, under the care of Mr. Bryce, the other by Mr. J. Greig, Junior, of Edinburgh. The first, after having been tested by Mr. Bryce for some days, was found quite unfitted for properly cleaning the fibre. It was therefore withdrawn.

18. There, therefore, only remained one machine to compete for the prize, *viz.*, that of Mr. Greig of Edinburgh.

19. There were two other machines in the experimental building, but as they belonged to Government they were not entered. They were American machines, patented by M. Rœzl.

20. The trials took place in the Government stallion stable in the stud, kindly placed at my disposal by Colonel Sir C. Doyle, Superintendent, Stud, where a shaft was erected by Mr. Prince, Officiating Superintendent, Roorkee Workshops, which was driven by a portable steam engine. This engine was received from the Roorkee Workshops.

21. The trials commenced on the 7th August, 1872, and were continued until the 22nd, four days excepted, caused by the breaking down of the machine. Before the trials under Colonel Hyde took place, both Messrs. Bryce and Greig were allowed to have any quantity of Rhea stems for experimental purposes, and in this manner the first crop of stems was exhausted. The trials with Mr. Greig's machine were therefore made with stems of the second crop, and for this purpose

98 maunds, or about 3½ tons, were cut and placed at his disposal. This quantity was found to be ample for the experiments ordered by the Judge. In his report to the Secretary to Government of India, Department of Agriculture, Revenue, and Commerce, Colonel Hyde thus describes Mr. Greig's machine:—"The weight of the machine is 1½ tons, the weight of the heaviest part—the fly-wheel—four cwt. The Patent Office specification leads the reader to understand that the machine patented was intended to turn out fibre clean and fit for sale in one operation. The machine does not succeed in effecting this, and there is attached to the machine, but not included in the patent, a scutcher (of the ordinary construction used in flax mills) of five feet diameter, having five blades, and making 260 revolutions per minute.

22. "All the fibre, after having passed through the machine, has also to be cleaned by the scutcher, to remove the small portion of the stalk and green bark not taken off by the first process, and found adhering to the fibre after it has left the first machine. The fibre is turned out very wet from the machine, and it is necessary to dry it in a free current of air. If the fibre is scutched wet, a second scutching becomes necessary when it is dried.'

23. "The machine, however, as must always be the case with machines of this kind, *i. e.*, contrived to do a work of which there is little or no experience available, and without means of obtaining the natural materials to work upon, is far from matured. Few, if any, of such machines are ever constructed at once able to do the work for which they are intended; most are generally perfected by degrees, through numerous partial failures,—experience gained in the process of working alone enabling many defects to be seen and remedied, and a perfect machine to be produced; and such appears to be the case with this mill, for, independent of whether it is or is not the best description of machine for preparing the fibre, it is on the one hand in many points very deficient in the

work the exhibitor sets it forward to perform, while on the other hand it is certain that it can be improved in much that is faulty.

24. "In the first four and a quarter hours the machine turned out 11¼ lbs. per hour. If the exhibitor had provided a properly drilled crew, and had confined his exertions to directing, in the place of working with his own hands, the outturn would have been much more.

25. "In the exhibitor's own trial of one hour he turned out 15½ lbs. of fibre, but the trial was too short and exceptional.

26. "In the work of producing the 2 cwt. of fibre, 207 lbs. were turned out in 37 hours, which gives 5½ lbs. per hour. This trial gave 63 lbs. per ton of stems, or 138 lbs. per acre, the outturn by hand being about 200 lbs. per ton." In summing up the working of the machine Colonel Hyde states:—"The machine is a *bonâ fide* meritorious attempt to meet the want that the Government has set forth as existing: the amount of success it has achieved cannot be definitely determined until the fibre produced has been valued, but as far as is in my province, I consider it entitled to a certain amount of reward.

27 "I do not think the machine is successful, or that it will continue in its present shape, but I believe that its construction and working cannot fail to advance the question, and to prove a considerable step towards solving the difficulty of producing a machine that will prepare the Rhea fibre. Considering, then, the outlay and the decided advance that the exhibitor has made in the work, also the fact that he alone has had the perseverance to come to trial, I would propose, for the consideration of Government, an award of £1,500 (one thousand and five hundred), leaving for further consideration any additional award Government may feel disposed to make on the receipt from England of the report on the quality of the fibre."

28. Such are Colonel Hyde's recorded opinions regarding Mr. Greig's machine,* and he further adds that the machine is of a character more suited to a large spinning factory than to such an establishment as would prove economical at a Rhea plantation. He further adds—"Independent of the first cost of such a machine, £200, which is in itself an objection, and the power required to drive it, the working and maintaining such machines in order would necessitate the establishment of a workshop far more extensive than is advisable. Hence, if it be possible to do the work required by a less expensive and more simple process, Mr. Greig's mill will certainly not be adopted."

* See Colonel Hyde's letter No. 782, dated 4th October, 1872, to Secretary to Government of India, Department of Agriculture, &c.

29. Colonel Hyde very properly adds that the main object to be kept in view is simplicity in construction, and that all endeavours should tend towards working out a process in which the most simple machines can be worked by the unskilled labor of the country, on the minimum outlay.

30. The American machine, Rœzl's patent, is of a much simpler construction, but it is also very defective, and does not turn out the fibre in a properly cleaned state. It turns out a much larger quantity, and is of so simple a construction as to be capable of being worked by the native community, and repaired by any village blacksmith.

31. To improve its construction, one of the Government machines has been sent to Colonel Hyde, Calcutta. A quantity, too, of fibre prepared by the machine has also been forwarded to Calcutta, in order that its value may be tested.

32. By Colonel Hyde the experiments were conducted with great tact, patience and consideration, and no one could have received a fairer trial than Mr. Greig did at the hands of the Judge.

33. To grow the plant is a very easy matter. It requires rich, well-drained, and manured land, and, occasionally, irri-

gation. It yields four crops annually, and each crop may be estimated at about 2½ tons of green stems, or 10 tons per acre per annum; and estimating the yield per ton of fibre at lbs. 112 per ton, we would thus have ½ ton of fibre per acre, which, at £45 per ton, would thus yield £22-10 per acre, and thus afford a considerable profit both to the grower and preparer.

34. This shews the value and importance of the plant; but before much good can be accomplished, a simple machine must be forthcoming. But though no machine has yet been obtained to clean properly the fibre, it can easily be prepared by hand with a blunt knife, and thus another kind of industry may be added to the country. But it must first be ascertained how much hand-cleaned Rhea fibre will fetch in the market before it can be recommended for general cultivation. There are now upwards of 35 acres of Rhea plants at Saharunpore under cultivation, and growing in the most luxuriant manner, from whence any quantity of stems can be obtained by parties anxious to carry on experiments. In addition to its value as a fibre, the green leaves afford excellent fodder for cattle, and which is greedily eaten by them.

35. The prize of £5,000 offered by Government is still left open to competitors, and it is to be hoped that a cheap, simple, but efficient machine may still be turned out under Colonel Hyde's guidance. Parties wishing to carry on the cultivation of the plant can now obtain plants from the gardens in any number.

36. *Cinchona cultivation.*—During the last year, Cinchona cultivation has made no progress,—all the large plants planted out at Hawulbaugh, Ayar Toli in Kumaon, Chundwallah in the Dehra Doon, Chejouri in Western Gurhwal, &c., having been destroyed by the frost in January. At Chundwallah and Raneekhet some plants of Cinchona Succirubra had attained a height of from three to five feet, but all when left exposed during the winter were cut down by the frost. To Colonel Ramsay 30 strong healthy plants were given, and planted in the Bhabur, all of which have died. To Raneekhet 50 plants

were sent, all of which have been destroyed by the frost. At Hawulbaugh and Ayar Toli I ordered all the two and three years old plants to be planted out in October last, and grown without any protection, and the result has been the destruction of every plant. There are still some twelve hundred small plants under glass; but the experiments, which have been carried on in the most careful manner for several years, shew that the Kohistan and the Doons are not fitted for Cinchona cultivation; that the plant can be grown under glass, but that the extremes of temperature are too great to admit of its cultivation in the open. In the Kangra Valley the cultivation has been tried by a company, and their operations carried on by an experienced European gardener. At Quito in the valley, at an altitude of about 4,000 feet, plants of Cinchona Succirubra, four and five feet in height, were all destroyed by the frost and snow. The cultivation was then tried at Bowarnah, at an altitude of 3,000 feet. Here, too, the results were equally unfavorable. The company therefore has been wound up. The cultivation has now received a fair, patient, attentive and prolonged trial by experienced and practical hands, and the results fully shew that. Cinchona cultivation can never become of any practical value in an economical point of view in the Doons or Kohistan of the North-West Provinces or Punjab; and in no locality where frost exists during the cold weather will it succeed. In the plains, the hot moist weather met with during the rains is equally hostile to this genus of plants. In the Statement No. 4, I have given the number of plants now in the Nurseries which I shall place under the care of the Overseers at Hawulbaugh and Mussoorie.

37. *Potatoe cultivation.*—A small supply of the following kinds of potatoes were received from Her Majesty's Secretary of State for India through Dr. Forbes Watson, *viz.*:—

Potatoes,	Rivers Royal.	Potatoes,	Red Skin Flower Ball.
,,	Kidney Nose.	,,	Early Goodrich.
,,	Forty Fold.	,,	Rivers' Royal Ash Leaf.
,,	Haize Kidney.	,,	Climax.
,,	Milky White.	,,	Californian.

38. Small quantities have been distributed to applicants, and the remainder sown in the Mussoorie Garden. Potatoes have now become one of the great food staples of the country, being extensively grown in the plains and Kohistan of the North-West Provinces and Punjab, as in Kumaon, Gurhwal, Jounsar Bawur, protected Hill States, Kangra, Dehra Doon, Saharunpore, Meerut, Futtehgurh, Boolundshuhur, Cawnpore, &c. Statistics shewing how the cultivation has spread and the extent carried on would be highly interesting, in order that care might be taken to prevent the degeneration of the plant by frequent renewal of fresh seeds: annually a small quantity ought to be imported from Europe for this purpose. In the neighbourhood of Saharunpore the white flower ball potatoe is now grown equal to the finest met with in Britain.

39. *Carolina Paddy.*—Early in June an acre of land was broken up by the English Howard plough, and a small bed about 8 square yards sown with Carolina paddy which germinated most freely. On the 19th July it was transplanted into an acre of land and irrigated. On the 18th October it was cut down; the yield was 27 maunds, and estimating the weight at 56 lbs per bushel, would thus give nearly 39 bushels per acre, a very high yield. The plant grows with great luxuriance, the straw being about five feet in height.

40. *Black Tartarian Oats.*—A small sample of Black Tartarian oats was sown on the 12th October, which germinated most freely. But though sown thus early it was not in a fit state to cut on the 11th April. On this date the canal was closed and did not re-open until the 2nd May; the result was, that most of the seeds were destroyed. A few may be saved to enable an experiment to be tried next season. It does not, however, appear to be adapted to this country.

41. *Silk Cultivation.*—Nothing has been done, barring the extension of the mulberry plantations in the Dehra Doon. By the Executive Engineer, Dehra Doon, five thousand young mulberry trees have been planted out in the Doon, and a

large number by the men of the 2nd Goorkas. True it is that it will not repay a European to take up the cultivation ; but were it taken up by the native community at large, as it is in China, it might become of the utmost value to the country. Some small attempts made by Europeans in the North-West Provinces and Punjab ended, no doubt, in failure ; but these were not persevered in sufficiently long to ensure success, having been suddenly closed for want of funds. In fact, they were mere spurts, and because they did not give immediate results they were abandoned. Native private enterprise scarcely exists ; and if the product be a novelty, it seldom receives any attention if its cultivation entails any risk. To village communities it would no doubt prove highly valuable, particularly to the female and weak members, as it would afford a light and remunerative work. Everywhere throughout the North-West Provinces, the mulberries fitted for feeding silk worms, *viz.*, Morus multicaulis, and Morus chineusis (grafted variety), will grow luxuriantly. The last named variety was introduced in a Wardian case about ten years ago, from China, and is now quite naturalized. The number first imported was three, and from them the many thousands of plants in the Dehra Doon and plains were raised. The Morus multicaulis is also quite naturalized.

42. *Fruit trees.*—The fruit trees received in March, 1872, from Her Majesty's Secretary of State, have been extensively propagated and distributed. This applies particularly to the following kind of vines, *viz.* :—

VINES.

1. Buckland's Sweet-water.
2. Royal Ascot.
3. Muscat Hambro.
4. Mrs. Princes' Muscat.
5. Muscat of Alexandria.
6. Lady Downes'.
7. Black Hambro.
8. Morris' early Hambro.
9. General della Marmora.
10. West's St. Peters.
11. Austriata.
12. Sweet-water.
13. Black Burgundy grape.
14. Black Bordeaux.
15. White Frontignan.
16. White Compagne.
17. Black Muscat.
18. Black Monucka.
19. Troveror's Muscat.
20. Crawford's Muscat, &c.,

and various kinds of apple, pear, quince, peach, apricot, nectarine, cherry, figs, raspberries, and gooseberries, which have already been brought to your notice, see my letter No. 360, dated 27th December, 1872, and which were inspected by His Honor the Lieutenant-Governor on his visit to the Mussoorie Garden in December last.

43. From seeds received from time to time from Her Majesty's Secretary of State, through Dr. Forbes Watson and others, many valuable timber trees, flowering shrubs, &c. have been raised and naturalized in the plains or Kohistan of the North-West Provinces, among which I may mention the funeral cypress.

1. Funereal cypress (cupressus Funebris.)
2. Cupressus Tournefortii.
3. Wellingtonia gigantia.
4. Cryptomeria Japonica.
5. Auracaria (Altingia) excelsa.
6. Camphor tree (cinnamomum camphora).
7. Cork bark oak (Quercus suber).
8. Chamaerops fortunei.
9. Ditto martiana.
10. Olive (Olia Europea).
11. Varnish tree of China (Dryandia vernicia).
12. Tallow tree (Stillingia sebefera).
13. Myrica sapida (yang mai).
14. Bohmeria nevia (Rhea).
15. Beef wood tree (Casuarina equisitifolia.)
16. Filbert (Corylus avelana).
17. Leechee (Euphoria Litchi).
18. Tea plant (Thea viridis).
19. Mahogany (sweetenia mahogani).
20. Log wood (Haematoxylon campechianum).
21. Grevillia robusta.
22. Shurifa (Anona squamosa).
23. Chilta (Dillenia speciosa).

24. Wampee (cookia punctata).
25. Cinnamon (laurus cinnamomum).
26. Broom (Spartium junceum).
27. Furze (ulex Europea).
28. Laburnum (cytisus laburnum).
29. Poinceana regia.
30. Asok (Jonesia asoka).
31. Locust tree (Ceratonia siliqua).
32. Loquat (Eriobotrya japonica).
33. Jalap root (Exogonium purga).
34. Ligustrum lucidum.
35. Stiphanotis Floribunda.
36. Petrea stapeliæ.
37. Bougain (villia glabra and spectabilis).
38. Eucalyptus.
39. Deyn gan or Cordia Macleodii.
40. Congea azuria.
41. Antigonon Liptopus.
42. Meyenia erecta.
43. Buddlea Lindleyana.
44. Fuchsia, &c., and many others.

44. The sweet chesnut (of which several parcels were received last year by pattern post, and two bushels by the Suez Canal) is now fairly naturalized in various localities in the North-West Provinces, as at Saharunpore, where there are eight plants, Chundwallah in Dehra Doon 150 plants, Mussoorie 30 plants, Chejoure 25 plants, Hawalbaugh 14 plants. This is exclusive of a large number of plants distributed throughout Kumaon, Gurhwal, and the Dehra Doon. One-half of the seeds received by the Suez Canal route were in tolerably good order, and will add greatly to the number of plants in the Province.

45. The chesnut seeds received by pattern post were very superior to those received in bulk by the Suez Canal, and were it not much more expensive, their transmission ought to be

confined to the former method. As yet none of the seeds received have germinated; they will therefore form the subject of another communication.

46. From the Secretary of the Acclimatization Society of France, a small parcel of Eucalyptus seeds have been received, which have germinated freely.

By the Director of the Royal Garden, Dublin, Dr. Moore, a fine collection of timber, flowering shrubs, &c., consisting of 65 kinds, has been presented in exchange.

47. *Vegetable Seeds.*—A considerable collection of vegetable seeds have been received from Her Majesty's Secretary of State through Dr. Forbes Watson, partly by pattern post, and partly by Suez Canal. Those received by the latter route arrived too late to be of any use in the plains for sowing. This was not so much to be regretted, as the seeds sent by Messrs. Landreth and Sons of Philadelphia had arrived in good time, and were available for the purpose. I have appended a statement shewing the results of the germination of the seeds received from the India Office for several years, and of seeds purchased from Messrs. Landreth and Sons, Philadelphia, and Cape seeds from Messrs. C. M. Vellet and Sons—See Appendix No. 5. Certain seeds, particularly of the Brassicaceæ or the cabbage tribe, cannot be trusted, for though they germinate freely, they frequently fail to give seeds fit to issue, barring cauliflower and broccoli and several kinds of radish. Most of the other kinds of vegetable seeds, particularly acclimatized seeds, seed freely if properly sown. But it often happens that many vegetable seeds do not germinate because they are sown at the wrong season of the year, or too early, and thus are destroyed, or they are eaten up by field mice, ants, &c., or they are sown too deep, and thus never appear, the cause being attributed to the want of vitality in the seeds, not to error of judgment in sowing too deeply or too early, or at the wrong season of the year. But these complaints are not confined to India. The same remarks are made in the United

States regarding the seeds issued by Messrs. Landreth and Sons, and this firm in one of their late publications remark :—"It cannot be doubted we should have less complaint of non-vegetating seeds if people would reflect more. How could it be expected that minute seeds should grow when covered deeply, or when sown under conditions of heat and drought." They further remark "that it is not uncommon to have cabbage, cauliflower, broccoli, turnips, &c., eaten up by the fly (and in this country by ants and field mice), and, unless a sharp look out be kept up, the little pest will have done its work whilst one may be looking for the seed to appear above ground." Too early sowing, or when the ground is highly heated by the sun's rays is another very common cause for the non-germination of seeds, and as a general rule, if a thermometer (Fahren.) is found at day-break to stand above 70° when sunk in the ground, cold weather seeds ought not then to be sown in the ground. They can, however, be sown in pans and pots, and kept in cool shady places, and transplanted when they have attained a height of four or five inches.

48. From Saugor a serious complaint was received last season from an officer of the inferiority of the seeds issued, one kind of seeds only being noticed, *viz.*, rat-tailed radish. It was remarked that the seeds germinated most luxuriantly, but that the tuber was so tough and rank as to be unfit to eat. To confirm what he had stated the officer sent a report on the tuber by a brother officer, by whom it was styled "beastly to eat." The radishes were therefore uprooted. The rat-tailed radish is so styled from its long pod, which is sometimes from 3 to 3½ feet in length, and which, when young and tender, is cut up and used in salad, this being the only part of the plant edible. It is not therefore to be wondered at that the tuber of the rat-tailed radish was condemned.

49. But although some kinds of seeds at times fail to germinate from the causes above mentioned, yet if ordinary care be taken, the following generally give satisfaction :—

1. Artichoke.
2. Asparagus.
3. Beans.
4. French or Kidney beans.
5. Scarlet, &c., Runner.
6. Beet.
7. Broccoli.
8. Cauliflower (Asiatic).
9. Capsicum.
10. Celery.
11. Cress.
12. Egg plant.
13. Endive.
14. Indian corn.
15. Mustard.
16. Lettuce.
17. Love apple or tomato.
18. Onion.
19. Parsley.
20. Peas.
21. Radish.
22. Spinach.
23. Vegetable marrow.
24. Squash.

50. And of hot-weather vegetables we may mention—

1. Jerusalem artichokes (Helianthus tuberosus).
2. Ruttaloo (Dioscorea sativa).
3. Indian corn.
4. Capsicum.
5. Sweet potatoes.
6. Country beans or saims.

51. Of the saims capable of being cultivated during the rains the following are issued from the gardens:—

1. The great scimeterpodded bean or bur saim (Canavalia gladiata).
2. Hulwa saim.
3. Ooda saim.
4. Green saim.
5. Kidney beans of kinds.
6. French beans.
7. Okra or Ramtoree (Abel moschus esculentus.)
8. Sag (Amaranthus oleraceus.)
9. Brinjal, or egg plant.
10. Small Tomato or love apple.
11. China badam or earth-nut.
12. Vegetable marrow.
13. Squash, &c.

52. *Tea cultivation.*—Tea cultivation progresses. But it is no longer carried on on Government account, as private enterprise now fully occupies the field. A fine trade is now springing up with Central Asia. Punjab and Affghan merchants now visit the different plantations in the Hills and Doons, and offer good paying prices for tea at the factories, and at the same time make their own arrangements for packing and transmitting the teas to the Punjab. To make the Tea Plantations of Kumaon, Gurhwal, Dehra Doon and the Punjab pay, good markets alone were wanting, as the teas there grown will always compete favorably with those grown in the much moister climate of Assam, Cachar and Darjeeling, where green teas are prepared with difficulty. For these reasons the Tea Factories of the North-West Provinces and Punjab will always be able to command the markets of Central Asia, as Green Teas are the only ones in demand by the Punjab and Cabul traders. It is too, a significant fact, that Indian teas have attracted the attention of the Russian Government, and favorable transit duties promised. For this part of India we may therefore expect to see a more rapid extension of the cultivation, and ere long the wild and waste tracts of Jounsar Bawur brought under cultivation with the plant. To open up the Central Asian tea trade we have long made strenuous efforts, and urged for years two of the largest tea firms of Amritsur to direct their attention to these markets. By them for years many thousands of pounds of teas manufactured in the Government factories have been purchased. The advance of the Russians too in Central Asia has no doubt tended to develop this market, the limits of which are not bound by tens of millions of pounds. The time, therefore, is not far distant when the produce of the hill districts will become as important to the State as those of the plains, and India a powerful rival to China in the markets.

53. I have appended a statement, No. 6, shewing the amount realized from the sale of teas from the Government godowns. There still remains a considerable quantity to be

disposed of; but as it is now chiefly coarse Black Teas or Bohea, for which there is but little demand, it will be some time before the godowns are cleared. Had it been Green Tea it might have been sold at once.—See Appendix Nos. 7 and 8.

54. By the sale of the Tea Leaves of the Chullar plantations, Rs. 131-5-6, and for Tea Seeds Rs. 181-8, have been realized.

55. *Improvements in the Gardens.*—In the Saharunpore Gardens upwards of a thousand fruit trees have been planted out, and the old and useless trees removed.

56. In the Chundwallah Nursery large avenues of the best kinds of fruit trees have been formed.

57. In the Mussoorie Garden the fine collection of Fruit Trees, received from Her Majesty's Secretary of State for India through Dr. Forbes Watson, has been planted out.

58. *Foresters and Gardeners.*—To the canal plantations two native foresters, and to public and private gardens five trained native gardeners have been forwarded.

59. The requisitions on the gardens for trained native gardeners are very numerous, and annually the demand increases. The result is, that there is scarcely a station in the North-West Provinces and Punjab where gardeners trained in the Saharunpore Gardens are not to be met with.

BUILDINGS.

60. *Museum.*—The foundations of the Museum have been secured by a pucka flooring of masonry, three feet in breadth, being carried round the building, thus preventing rain-water sapping the foundations.

61. The green-house at Mussoorie, I am sorry to say, is still in an unfinished state, which has caused the loss of a large number of valuable plants during the cold season.

62. *Overseer's house at Mussoorie.*—To the Overseer or Head Gardener's house two small rooms have been added, and an iron verandah. In this small house the Head Gardener can now be accommodated when deputed from Saharunpore.

A tank for water is urgently required in the garden, to irrigate the vastly increased collection.

63. *Donations to the Museum and Library.*—These I have shewn in the Appendix Nos. 9 and 10; and in No. 11 I have shewn the donations of seeds and plants made to the Gardens.

64. *Budget and Sale Receipts and Expenditure.*—In the detailed statement No. 12 I have shewn the budget receipts and the receipts from the sale of plants, &c., and expenditure. The sale receipts of the Gardens shew a considerable increase on those of the former year, and it would, I am confident, have been much greater had the green-house at Mussoorie been finished. For want of a proper place it was impossible to exhibit the many fine plants now there available.

65. Before concluding this report, I beg to bring to notice the highly intelligent and active and energetic Head Gardener, Mr. R. J. Nisbet, who joined the Gardens in September last from the Edinburgh Royal Botanic Gardens, and has done good service. By the late acting Head Gardener Jawar Singh I have been most ably assisted, and I respectfully trust that his services will again soon be placed at the disposal of the Gardens for work in the Mussoorie garden, where they are so urgently required. The chowdry Nanuck Chund has conducted his duties with the usual ability, energy, and tact. The heavy office duties, the issuing of plants and seeds, &c., have been ably carried on by Baboos Nahur Singh and Ramjee Doss, assisted by the seed godown-keeper Heera Lall, and by Baboo Mohiny Mohun Ghose the account and correspondence department has been diligently and ably conducted.

2.—*From* C. A. ELLIOTT, ESQ., *Secretary to Government, North-Western Provinces, to* W. JAMESON, SURGEON-MAJOR, *Superintendent Botanical Gardens, North-Western Provinces,* (*No.* 304.)—*Dated Allahabad, the* 30*th October*, 1873.

I AM directed to acknowledge the receipt of your letter No. 90, dated 10th May, 1873, being the Annual Report on Government Gardens in these Provinces for the year 1872-73.

2. The figures noted below shew, for the year under review, as compared with the previous year, the number of fruit trees, flowering shrubs, and parcels of seeds distributed from the gardens and the departments by which they were received. Upwards of half a ton of teak seed was furnished to the Government Gardens at Calcutta, and this supply will, it is hoped, prove useful in advancing the cultivation of teak in Bengal, which is believed to have recently formed a subject of consideration in the Lower Provinces. The supplies of trees

Department.	Fruit trees.		Flowering shurbs and timber trees.		Parcels of seeds.	
	1871-72.	1872-73.	1871-72.	1872-73.	1871-72.	1872-73.
India Office, London,	...	...	...	...	99	58
Canal Plantations, ...	...	5,000	14,950	1,03,300	2,044	2,675
Military Department,	15,980	3,038	12,136	6,720	643	190
Public Gardens, ...	1,277	1,174	1,08,051	6,467	160	434
Soldiers' Gardens, ...	...	500	...	773	...	335
Railway, ...	2	16	204	1,653	21	64
Miscellaneous, ...	18,708	27,665	12,622	37,853	583	1,774
Total, ...	35,967	37,393	1,47,963	1,56,766	3,550	5,530

and shrubs to the canal plantations, of which you are the Conservator, have been greatly in excess of the preceding year.

	1871-72.		1872-73.	
	lbs.	ozs.	lbs.	ozs.
Extract of Hyoscyamus, ...	384	11	207	0
Dried leaves of ditto, ...	265	0	224	0
Atees Tubers (Aconitum heterophyllum), ...	1,280	0	1,409	8
Oak bark, ...	80	0	148	0
Kamaila powder, ...	38	0	64	0

The issues of Medical Stores continue to be satisfactory; and the figures of distribution generally shew a steady increase. The value of the Government Gardens as a source of distribution to the various departments under Government cannot be over-rated.

3. *Paragraphs 14 to 35.*—The result of two and a half years' cultivation of the Rhea plant is, that 35 acres are planted with it, yielding green stems at the rate of 10 tons per acre in the year. So far as the Government Gardens are concerned, the demand for large quantities of the fibre has been well responded to. The question, however, of the machines for clean-

ing the fibre, and the experiments for testing their working, to which you have devoted much space in your report, in itself interesting and important, has been disposed of under the direct orders of the Supreme Government.

4. *Paragraph* 36.—The subject of the experimental cultivation of Cinchona, and the question of the advisability of withdrawing from the further prosecution of the experiment, have been separately considered, and it has been conclusively shewn by sustained and patient experiment, that no place in the North-Western Provinces is sufficiently free from the risk of frost (which is fatal to the propagation of the plant) to admit of its successful cultivation.

5. *Paragraphs* 37 *and* 38.—His Honor has read with interest your remarks on the cultivation of the potato, and the measures which should be taken with the view of preventing the degeneration of the staple. The subject is important, and His Honor is glad to find that it has formed the subject of your special attention.

6. *Paragraph* 44.—A considerable number of seeds of the Sweet Chesnut were received during the year, which you state will add considerably to the number of plants in these Provinces. It is hoped that these plants may be largely propagated in the hills, especially at Ranee khet, where the nurseries should receive your constant attention and aid, in view of the advantages of such trees to the soldiers at that station.

7. *Paragraph* 47 *et seq.*—The results of the sowing of the vegetable seeds received by you from the India Office and the United States, as compared with the Cape seeds, are shewn on the margin. The large percentage of failure in the case of

Whence received.	No. of kinds received.	Germinated.	Failed.	Percentage of failures.	Gave seed.
India Office, ...	156	140	16	10	85
Cape, ...	24	23	1	4	20
United States, ...	41	38	3	7	14

the seeds from the India Office is probably due to the larger number of varieties received. It would have been satisfactory to know generally how far the seeds produced from plants at the Government Gardens, and distributed by you, have succeeded. His Honor desires that you will endeavour to procure information from all quarters on this subject, noting the results in your next report.

8. *Paragraph* 52 *et seq.*—The present condition and future prospects of tea cultivation in the Provinces have been lately the subject of separate discussion, and full statistics regarding them have been laid before the Government of India. Government has now entirely withdrawn from connection with the cultivation of tea, leaving the field open to private enterprise. The action of Government during the year was limited to the sale of a portion of the teas remaining in store. At the commencement of the year under report, the amount of tea remaining undisposed of was 84,028 lbs. of which 25,714 lbs. have been sold during 1872-73, leaving 58,314 lbs. in store at the close of the year. This consists chiefly of teas of the coarser sorts, for which it is more difficult than in the case of the finer kinds to find purchasers. The amount derived from the sale of the tea, as marginally shewn, was Rs. 12,009-8-0, including Rs. 68-12-0 realised during the year on account of sums previously due. This amount is thus accounted for :—

	Amount sold.	*Sale proceeds.*
	lbs.	Rs. a. p.
Hawulbagh (Kumaon), ...	9,736	1,906 8 0
Chundwallah (Dehra Doon),	15,978	10,034 4 0
Total, ...	25,514	11,940 12 0
Add on account outstanding balance collected, ...	...	68 12 0
	Rs.	12,009 8 0

Chundwallah.	Rs. a. p.	Rs. a. p.
Paid into Treasury, ...	9,589 1 0	
Deduct Commission, ...	482 11 0	
		10,071 12 0

Hawulbagh.

Paid into Treasury,	...	1,840	13	6	
Deduct Commission,	...	96	14	6	
					1,937 12 0
			Total Rs.		12,009 8 0

9. *Paragraph* 56 *et seq.*—On the occasion of his tour during last cold season, His Honor visited the Saharunpore, Chundwallah, and Mussoorie Gardens, and was fully satisfied with the excellent order in which they were found. The green-house at Mussoorie is a valuable addition to the gardens; and with reference to your remarks in paragraph 61, regarding the unfinished state of this building, I am to observe that, with the exception of a protecting cover of wire-work, it was apparently complete on the occasion of His Honor's visit: you are requested to state what further additions to the green-house are, in your opinion, required.

10. The accounts of the gardens fall under two heads:

(1.)—The general expenses incurred in the keeping up of the gardens to be set against the budget grant.

(2.)—A fluctuating account of the amount realized by the sale of seeds, plants, &c.

11. A sum of Rs. 10,860 was allotted in the budget on account of establishment at the Saharunpore Garden, against Rs. 10,560 in 1871-72, and Rs. 11,150 were spent on this account against Rs. 11,410 in the previous year. Of the above allotment Rs. 1,800 were granted for Rhea cultivation, and the whole sum was spent. No detailed comparison can be instituted in respect of the several items of establishment between the receipts and expenditure, owing to the want of the same details in your accounts as are given in the budget. On this subject I am to refer you to my letter No. 305, of this day's date, to your address, containing instructions as to the mode of exhibiting the accounts, which should in future be adopted.

12. For Cinchona cultivation Rs. 5,850 were allotted, but here the expenditure was below the grant—*viz.*, Rs. 4,314-12-0. Rs. 3,500 were granted for contingencies, and Rs. 1,109-14-3 for water-rent and land rent, while Rs. 3,852-14-7 were realized from sales, against which an expenditure of Rs. 8,874-7-7 was incurred. The total expenditure of this garden was Rs. 24,339-3-7.

14. For the Mussoorie Garden Rs. 790 were allotted in the budget for establishment, and Rs. 612-1-6 were made by sales and by the realization of an outstanding balance. The total expenditure amounted to Rs. 1,404-1-6.

15. No allotment was made for the Hawulbagh Garden under the head of Botanical Gardens, but from a reference to the Accountant-General it appears that a sum of Rs. 8,700 was entered for it under the head of "Tea Nurseries and Plantations." Against this grant has to be set an expenditure of Rs. 3,768 on establishment, Rs. 720 on contingencies, and Rs. 496-0-9 for the carriage of seeds and plants, or a total expenditure of Rs. 4,984-0-9.

16. The total cost of all the gardens, including superintendence, was Rs. 45,127-5-10, against a cash income of Rs. 4,961-0-10, leaving a balance of Rs. 40,166-5-0 to represent the net cost of the gardens to the State.

17. In conclusion, I am to say that the results of the year's management are such as to merit the thanks of Government.

18. The delay in the issue of these orders has been owing to the necessity of making a reference to the Accountant-General regarding the accounts of the gardens, a reply to which has only just been received.

Art. XXXII.

REPORT ON THE METEOROLOGY OF THE NORTH-WESTERN PROVINCES, FOR THE YEAR 1872.

1.—*From* M. THOMPSON, ESQ., M.D., *Reporter on Meteorological Observations, to* C. A. ELLIOTT, ESQ., *Secretary to Government, N.-W. Provinces* (*No.* 130).—*Dated Roorkee, the* 16*th April*, 1873.

I HAVE the honor to submit the annual report on the meteorological observations taken in the North-Western Provinces during the year 1872.

Observatory Stations.—The following table gives the names, situation, and height above sea-level of the several stations :—

Name.	Lat.*	Lon.	Distance in miles from Allahabad, with direction.†	Height in feet above sea-level.
Chukrata, ...	30° 40′	77° 55′	391 N. W. by N.	7,056
Raneekhet, ...	29° 38′	79° 29′	270 N. N. W.	6,143
Dehra, ...	30° 20′	78° 8′	369 N. W. by N.	2,232
Roorkee, ...	29° 53′	77° 54′	346 N. W. by N.	880
Meerut, ...	29° 41′	77° 41′	313 N. W.	739
Bareilly, ...	28° 21′	79° 27′	214 N. N. W.	570
Agra, ...	27°	78°	233 N. W. by W.	551
Futtehgurh, ...	27° 23′	79° 48′	168 N. W.	503
Lucknow, ...	26° 50′	81°	100 N. by W.	364
Allahabad, ...	25° 26′	81° 52′	...	289
Goruckpore, ...	26° 46′	83° 18′	114 N. E.	255
Benares, ...	25° 20′	83°	64 E.	263
Jhansie, ...	25° 27′	78° 37′	165 W.	940 ?
Ajmere, ...	26° 27′	74° 40′	388 W. by N.	1,800 ?

Inspection of Observatories.—The observatories at Meerut, Agra, Allahabad, Goruckpore, and Benares were visited by me this cold weather. A report of this inspection has already been submitted to Government in No. 42 from this office,

* All latitudes are north, and longitudes east.

† These distances and directions are taken by measurement from a map published by the Surveyor-General of India in 1871.

dated the 3rd of February last. The instruments were generally found in good order; the arrangements of the observatories were also good, and the native observers were found able, in point of knowledge, for their work. The observatories at Dehra and Raneekhet will be visited in the course of the current year.

Hourly Observations.—The series of hourly observations, which had been continued into last year, were interrupted by the death of the observer at Roorkee, Sheudyal Singh. As other arrangements had to be made to carry on his duties, it has not been found possible to continue these observations since his death.

Meteorological Instructions at the Agra Medical School.—A course of lectures on Meteorology was as usual given by Meer Altaf Ally during November and December of 1871, and January and February of 1872. There will, however, be no further course of instruction given in this way, as at the examination, which was held by myself, on the subjects of the course of lectures, it was found that the students had profited so little by the lectures that no one was found worthy of the Government prizes. The course of lectures will, therefore, not be resumed. This is the less to be regretted, as Meer Altaf Ally has now published his lectures in the form of an Oordoo work entitled the "Threshold of Meteorology." This work has been admitted to compete for one of the prizes given by His Honor the Lieutenant-Governor to approved translations of English works into the vernacular.

Barrack Temperature Registers.—These, by a Resolution of the Government of India, were discontinued in July last; but up to that month registers had been received from Allahabad and Morar, and after they had been collated, the results were sent to the Sanitary Commissioner with the Government of India. There was nothing remarkable in the registers except the discrepancies in the temperatures noticed at the same hours of observation.

Monthly Reports.—From the registers sent in from the above stations on the completion of each month, a report was prepared and published in the *Government Gazette*. The form of these reports is the same as those published in 1871. They have been reprinted, and constitute Appendix A. of this annual report. It would be more advantageous to publish a weekly instead of a monthly report, and Government is aware that I made a proposal to that effect; but it has not been carried out, as I would have required a clerk to have helped me with the large amount of additional work it would have involved, and sanction to this increase to the establishment was refused by the Government of India. As may be seen, the monthly reports only give the means of the observations; but in a weekly report it would be possible to publish the observations in detail, and this should be done, as the observations are now far more trustworthy than they were; and printing them in smaller groups of a short period like a week forms a better basis on which to collate the numbers than the more bulky group of a month. Moreover, the observations are now becoming so voluminous, that it is not easy to preserve them in manuscript, and the losses of any of the registers prevents the verifying of past observations. In revising the tables of barometer and thermometer means given below, I have, to my great regret, discovered that a few of the registers belonging to past years are missing, so that I was unable to make a comparison with the original numbers.

It seems proper that I should here remark on the matter of extending the work of the Reporter on Meteorology. In paras. 5 and 11 of No. 1518A. of 1872, Revenue Department, North-Western Provinces, it is suggested that I should collate observations other than those embraced in this report; as, for instance, those made in other Presidencies or Provinces, or even beyond India altogether. To do this on the present basis of this office is impossible, even in drawing up an annual report. The materials for such a comparison are not received with

regularity, and even if they were, the Reporter on Meteorology could not, single-handed as he is at present, undertake so very serious an addition to the work that already exists. The same remark applies to the rainfall returns of the Revenue Board. The final collating of these ought to be done by the Reporter on Meteorology, but until he has adequate assistance given to him, the work there is at present is as much, or even more, than he can well accomplish.

Barometer and Temperature Charts.—Much of the information given in the monthly reports is obtained from the charts which are prepared of the daily observations. As remarked in the report for 1871, these detailed charts are not printed on account of the great expense of doing so. For publication, recourse therefore is had to a chart of a briefer kind, in which only monthly means appear. A series of these for 1872 constitutes Appendix B. of this report. These charts are constructed to show the monthly mean air-pressure of the proximate maximum and minimum periods of the day, which are at 10 and 16 hours; and by means of dotted lines the means of all the barometer observations are expressed. There has been also added in the charts of this report a thin line, which shows the monthly means of the humidity of the air. In the thermometer charts the monthly means of the maximum, minimum, and mean daily temperatures in the shade are shown. These are exhibited by thicker lines; the thin lines show the means of the readings of the wet-bulb thermometer, or the temperature of evaporation. The shaded columns represent the total rainfall of the month.

These charts, as far as the air-pressure, temperature, and humidity are concerned, show that a great similarity of these weather elements prevails at the various stations. The barometer, from reading high in January, gets less and less to June, and in some places to July; then it begins to increase again, slowly at first—that is, in August and September—

then much more quickly in October and November, and in December still increasing, but to a less extent.

The humidity line is a descending one to April, and in some places to May; it turns upwards in June, but only a little, mounting much more in July and August. The second change begins in September, when the humidity gets slightly less; in October and November it lessens a great deal, and in December it again increases.

The temperature increases greatly in the first four months, not increasing much in May, but still remaining high. In June the line turns downwards, but only to a limited extent, and sometimes not at all; the fall continues in July and August, but still only moderately, while in September it hardly decreases at all, and in a few instances the temperature, at least of the day hours, really increases; this is seen in the line representing the means of the maximum thermometer. During October, November, and December, a continuous and more decided fall in the temperature ensues.

The barometer curve shows a convexity downwards, and the thermometer a convexity upwards; they are, therefore, speaking generally, the converse of each other.

It is easy to give a reason for the appearance which the temperature lines present. The course of the sun, from the southern to the northern tropic, accounts for the swift rise in temperature up to May, and this increase in heat would go on in June were it not for the interference of the clouds and the rain brought up by the south-west monsoon. The temperature line during July, August, and September are the obvious interpretation of the state of the sky and the air which prevails during the rainy season. The appearance of the barometer lines is not so easy of explanation, for the increase of temperature, which accompanies the decrease of air-pressure in the first five months of the year, may produce two effects on the atmosphere; one of them is to increase its elastic

force, which ought to show itself in a higher barometer, and the higher the heat the higher should the barometer readings be; the other effect is, that the air expands, and flowing upwards, leaves the area of increasing temperature, and the barometer consequently reads less,—a result which is probably helped by the state of motion which the air is in while being expanded and removed. In theory, therefore, there are two effects which should go far to neutralise each other, but in fact such is not the case, for the diminishing air-pressure shows that the removal is the effect which is mostly taking place, and that it is overcoming the increased elastic force.

There are other circumstances, however, and particularly the winds, which, when taken into consideration, make this simple view of the matter a much more difficult one.

And the question becomes still more difficult in the rains, for during them there is the abundant aqueous vapour to be considered. In theory the addition of the aqueous vapour to the atmosphere should increase the pressure, but the continual conversion of the vapour into rain should, on the other hand, lessen it; in fact, the barometer reads higher, and continues to rise during at least the latter part of July and the whole of August, when the precipitation of the vapour in the form of rain is very great. The elastic force of vapour, which is one of the points determined in the daily observations, is always high during the rainy season; indeed, it is then higher than at any other time of the year. It is very difficult to understand why it should be so, unless it is supposed that what is indicated by the instruments is only the state of the lower strata of the atmosphere, and that at high altitudes, there is, during the rains, or at least after every heavy rainfall, great dryness and a much diminished elastic force of vapour.

After the rains, and onwards to November, the air-pressure increases. We may suppose the cause of this to be the reverse

of that which caused the diminution from January to June, —namely, that there is now an inflow of air which is sufficient to bring great increased pressure, notwithstanding the diminution which the elastic force suffers from the decreasing temperature.

In December, however, although the heat is still getting much less, the air-pressure increases only a very little; this was especially the case in 1872. This is another anomaly for which it is difficult to find an explanation.

Summary of the Weather during 1872.—In January the mean temperature was one degree colder, and the humidity about 25 per cent. higher, than the average of the last five years. Rain fell in the first four days, on the 14th, 15th, or 16th, and 24th or 25th. Fogs were frequent in the mornings of the first-half of the month, and during that time the weather was chilly and damp. The same cool and moist weather, with cloudy skies, extended into February, especially in the first eight days ; the mean temperature of the whole month was nearly four degrees lower than in the previous five years. In the last five days of February and the first six of March the sky was cloudy as a rule, and the temperature low; the rest of March, except the four days from the 12th to the 16th, and from 29th to the end, had clear and rather warm weather, the mean temperature rising considerably over the average. April was a very normal month, except, perhaps, in the absence of storms. Those which occurred on the 10th at Benares, on 16th and 18th at Goruckpore, and the 20th at Agra and Dehra, were very slight. In May also the weather was much as usual: some mild dust-storms took place between the 10th and 20th, which kept the weather cool and agreeable till nearly the end of the month.

The rains set in on the 23rd of June, but previous to that, signs of their coming were given in several showers which fell

from the 12th to the 16th, and the occurrence of clouds about the same period. In the first third of June the weather was hot and dry, but not unusually so. The weather during July, August, and September was very characteristic of the rains, —constant clouds in the sky with rainy periods, followed by intervals of a few days of fair weather. As a rule the air is still in the rainy months, especially from sunset to sunrise; and this was very notably the case during the last rainy season.

The rains came to an end from the 21st to the 24th of September, and along with their cessation came the usual clearing up of the sky, a change of wind from an easterly or south-easterly to a westerly, or north-westerly direction, and a gradual decrease in temperature.

There was nothing unusual to record during the year; the weather was altogether very normal.

Cost of maintenance of Meteorological Stations.—In appendix C. will be found a statement of the expense incurred in maintaining the meterological establishment and observatories from 1st of April, 1872, to 31st of March, 1873. The total charge there given does not include any charge for printing, nor for the original cost of instruments. The total expense exceeds that of the year 1871-72 by Rs. 535-13-6; this increase is more than accounted for by the increase of pay to native observers. These are all, with the exception of the observer at Jhansie, now on the new scale, which allows an increase of Rs. 5 a month every year until the amount reaches Rs. 40 a month; there will, therefore, for two or three years to come, be an increase from this cause.

In last report the salaries of ten observers only were accounted for, although eleven were entertained; this arose from the observer's pay at Allahabad, although sanctioned, not having been drawn.

TABLE OF MEAN BAROMETER READINGS, REDUCED FOR TEMPERATURE, BUT NOT FOR SEA-LEVEL.

MEAN BAROMETER IN DEHRA.

Year.	Jany.	Feby.	March.	April.	May.	June.	July.	Augt.	Septr.	Octr.	Novr.	Decr.
1872, ...	27·760	27·702	27·652	27·624	27·462	27·369	27·374	27·386	27·519	27·645	27·743	27·740
1871, ...	27·731	27·696	27·719	27·562	27·480	27·347	27·340	27·406	27·486	27·625	27·739	27·796
1870, ...	27·692	27·658	27·622	27·566	27·408	27·366	27·313	27·385	27·509	27·629	27·731	27·769
1869, ...	27·779	27·708	27·655	27·562	27·432	27·311	27·358	27·421	27·480	27·622	27·775	27·752
1868, ...	27·765	27·682	27·658	27·562	27·527	27 346	27·364	27·353	27·497	27·663	27·745	27·791
Mean, ...	27·745	27·689	27·661	27·575	27·462	27·348	27·349	27·390	27·498	27·636	27·746	27·769

MEAN BAROMETER IN ROORKEE.

Year.	Jany.	Feby.	March.	April.	May.	June.	July.	Augt.	Septr.	Octr.	Novr.	Decr.
1872, ...	29·109	29·053	28·963	28·861	28 728	28·622	28·655	28·671	28·820	28·952	29·094	29·089
1871, ...	29·093	29·009	28 941	28·849	28·755	28·616	28·627	28·692	28·783	28·922	29·060	29·141
1870, ...	29·056	29·010	28·970	28·853	28·668	28·638	28·590	28·670	28·803	28·926	29·057	29·126
1869, ...	29·147	29·071	28 996	28·868	27·704	28·576	28·642	28·718	28·783	28 942	29·114	29·109
1868, ...	29·142	29·055	29·002	28·873	28·820	28·627	28·648	28·657	28·783	28·971	29·082	29·152
Mean, ...	29·109	29·039	28·974	28·861	28·735	28·616	28·632	28·681	28·794	28·942	29·081	29·123

Mean Barometer in Meerut.

Year.	Jany.	Feby.	March.	April.	May.	June.	July.	Augt.	Septr.	Octr.	Novr.	Decr.
1872, ...	29·252	29·188	29·097	28·989	28·859	28·746	28·761	28·787	28·937	29·078	29·198	29·221
1871, ...	29·221	29·132	29·070	28·962	28·862	28·718	28·738	28·819	28·896	29·030	29·182	29·322
1870, ...	29·192	29·138	29·071	28·975	28·781	28·748	28·688	28·789	28·906	29·043	29·202	29·250
1869, ...	29·342	29·410	29·109	28·996	28·798	28·662	28·726	28·790	28·887	29·044	29·221	29·227
1868, ...	...	...	...	...	...	28·765	28·767	...	...	...	...	...
Mean, ...	29·252	29 217	29·086	28·980	28·825	28·728	28·736	28·796	28·906	29·048	29·201	28·255

Mean Barometer in Bareilly.

Year.	Jany.	Feby.	March.	April.	May.	June.	July.	Augt.	Septr.	Octr.	Novr.	Decr.
1872, ...	29·417	29·382	29·279	29·177	29·059	28·870	28·966	28·989	29·139	29·283	29·338	29·412
1871, ...	29·388	29·309	29·236	29·148	29·049	28·898	28·911	28·978	29·060	29·202	29·349	29·433
1870, ...	29·330	29·297	29·229	29·147	29·971	28·952	28·981	28·987	29·115	29 241	29·358	29·422
1869, ...	29·542	29·340	29·251	29·110	28·960	28·816	28 912	28·983	29·064	29·221	29·391	29·373
1868, ...	...	...	...	29·182	...	...	29·011	...	29·180	...	...	...
Mean, ...	29·419	29·332	29·249	29·153	29·010	28·884	28·956	28·984	29·112	29·237	29·359	29·410

Mean Barometer in Agra.

Year.	Jany.	Feby.	March.	April.	May.	June.	July.	Augt.	Septr.	Octr.	Novr.	Decr.
1872, ...	29·468	29·412	29·313	29·189	29·057	28·958	28·967	29·002	29·156	29·300	29·418	29·446
1871, ...	29·436	29·340	29·269	29·162	29·053	28·900	28·931	29·001	29·083	29·226	29·385	29·466
1870, ...	29·397	29·336	29·264	29·161	28·989	28·943	28·881	28·983	29·108	29·240	29·390	29·460
1869, ...	29·461	29·392	29·298	29·184	29·006	28·869	28·924	28·998	29·062	28·254	29·441	29·434
1868, ...	29·471	29·394	29·321	29·202	29·116	28·942	28·946	28·983	29·097	29·286	29·406	29·476
Mean, ...	29·447	29·375	29·293	29·179	29·044	28·922	28·929	28·993	29·101	29·261	29·408	29·457

Mean Barometer in Futtehgurh.

Year.	Jany.	Feby.	March.	April.	May.	June.	July.	Augt.	Septr.	Octr.	Novr.	Decr.
1872, ...	29·578	29·472	29·355	29·252	29·111	29·017	29·097	29·060	29·203	29·338	29·468	29·498
1871, ...	29·535	29·450	29·372	29·264	29·169	29 017	29 049	29·105	29 192	29·336	29·488	29·577
1870, ...	29·518	29·454	29·376	29·286	29·108	29 069	29·014	29·119	29·214	29·375	29·509	29·561
1869, ...	29·580	29·494	29·434	29·300	29·157	29·023	29·065	29·141	29·180	29·360	29·552	29·549
1868, ...	...	...	...	...	...	...	...	...	...	..	29·599	29·597
Mean, ...	29·553	29·467	29·384	29·276	29·136	29·031	29·056	29·106	29·197	29·352	29·523	29·556

Mean Barometer in Lucknow.

Year.	Jany.	Feby.	March.	April.	May.	June.	July.	Augt.	Septr.	Octr.	Novr.	Decr.
1872, ...	29·696	29·622	29·507	29·391	29·279	29·174	29·184	29·193	29·357	29·458	29·597	29·634
1871, ...	29·658	29·581	29·521	29·401	29·298	29·141	29·162	29·239	29·319	29 455	29·616	29·712
1870, ...	29·638	29·573	29·496	29·404	29·208	29·169	29·125	29·216	29·325	29·481	29 619	29·691
1869, ...	29·736	29·597	29·540	29·396	29·252	29·139	29·192	28·266	29·314	29·488	29·694	29·697
1868, ...	29·707	29·617	29·543	29·407	29·368	29·174	29·182	29·217	29·337	29·528	29 655	29·745
Mean, ...	29·687	29·598	29·521	29·399	29·281	29·159	29·169	29·226	29·330	29·482	29·636	29·696

Mean Barometer in Benares.

Year.	Jany.	Feby.	March.	April.	May.	June.	July.	Augt.	Septr.	Octr.	Novr.	Decr.
1872, ...	29·805	29·722	29·606	29·504	29·376	29·285	29·280	29·314	29·468	29·603	29·753	29·748
1871, ...	29·767	29·681	29·603	29 509	29·422	29·264	29·288	29·367	29·394	29·589	29·726	29·819
1870, ...	29·727	29·670	29·591	29·489	29·306	29·279	29·228	29·316	29·425	29·568	29·719	29·789
1869, ..	29·814	29·710	29·624	29·488	29·338	29·220	29·260	29·355	29·399	29·576	29·774	29·763
1868, ...	29·828	29·712	29·631	29·489	29 454	29·251	29·280	29·327	29·421	29·615	29·735	29·814
Mean, ...	29·788	29·699	29·611	29·496	29·379	29·260	29·267	29·336	29·421	29·590	29·741	29·786

This table is an extension of that which appeared in last year's report. Each of the means contained in it has been compared in the great majority of cases with the original registers. The means have not been reduced by the sea-level correction, as was the case with those given for last year. The correction then used was incorrect, and until a more accurate correction is obtained, the means must be given unreduced.

I have not been able to detect any local peculiarities in the distribution of the atmospheric pressure during the past year, except one, which will be alluded to below. I have also charted the Calcutta barometric readings for every month, and compared them with those in stations in the North-Western Provinces; but in the greater number of months the curves had a very close resemblance. In June, however, the following points were observed: up to the 16th the curves were very much alike; there then ensued a fall in the barometer, which was broken by slight rises in the North-West on the 20th and 23rd, but in Calcutta only on the 20th; the fall then continued to 16 hours of the 27th at Calcutta, and to the same hour of the 26th in the North-West. From the summit to the base of this fall there was a range of ·78 of an inch at Calcutta, while in the North-West it was nowhere greater than at Benares, where it only amounted to ·42. After the 27th to the end, the barometer rose in the North-West by from ·15 to ·20, but in Calcutta it did not exceed ·10 of an inch. In September the curves were generally alike, except on the 11th and 12th, when there was in Calcutta a rapid depression of ·10 each day; in the North-West the fall did not amount to the half of this, especially that on the 11th. In December, there was an increase of pressure on the 17th, which was less marked in Calcutta than in the North-West, and in the latter the rise was more marked in proportion as the stations were situated more to the westward.

The greatest local peculiarity which I have observed during the past year is, that the barometric range in the

hill stations is much smaller than in those situated on the plains. This limited range has not been noticed now for the first time, but is a constant feature in the air-pressure, as the following tables show :—

RANGE OF BAROMETER FOR 1870.

	Chuckrata.	Raneekhet.	Dehra.	Roorkee.	Agra.	Benares.
January,	·063	...	·094	086	·112	·102
February,	·060	...	·092	·091	·110	·106
March,	·060	...	·080	·085	·110	·112
April,	·056	....	·094	·103	·121	·112
May,	·041	...	·092	·089	·103	·103
June,	·046	...	·095	·090	·100	·092
July,	·042	...	·072	·077	·089	·087
August,	·054	...	·078	079	·151	·087
September,	·057	...	·078	·079	·088	·087
October,	·055	...	·100	·093	·102	·095
November,	·053	...	·095	·115	·106	·090
December,	·026	...	·095	·085	·113	·096

RANGE OF BAROMETER FOR 1871.

	Chuckrata.	Raneekhet.	Dehra.	Roorkee.	Agra.	Benares.
January,	·040	·008	·085	·084	·104	·107
February,	...	...	...	·081	·103	·104
March,	·019	...	·084	·080	·060	·105
April,	...	·024	·094	·090	·120	·110
May,	...	·032	·096	·092	·118	·113
June,	...	·048	·082	·091	·095	·094
July,	...	·120	·065	·100	·072	·073
August,	...	·044	·066	·077	·076	·081
September,	...	·049	·102	·103	·103	·090
October,	...	·030	·094	·089	·096	·103
November,	...	·029	·096	·093	·098	...
December,	...	·020	·093	·081	·102	·109

RANGE OF BAROMETER FOR 1872.

	Chuckrata.	Raneekhet.	Dehra.	Roorkee.	Agra.	Benares.
January, ...	...	·034	·088	·084	·107	·110
February, ...	...	·023	·085	·087	·103	·045
March, ...	·047	·015	·083	085	·113	·112
April, ...	·030	·051	·079	·093	·119	·106
May, ...	·029	·037	·075	·105	·099	·097
June, ...	·032	·040	·080	·116	·135	·089
July, ...	·034	·050	065	·082	·059	·084
August, ...	·043	·061	·077	·082	·077	·088
September, ...	·051	·050	·086	·076	·110	·110
October, ...	·054	·064	·091	·085	·101	·095
November, ...	·050	·060	088	·039	·110	·115
December, ...	·049	·055	·090	·115	·101	·152

Chuckrata and Raneekhet are situated upwards of 6,000 feet above sea-level, and the height of the plain country near them does not anywhere exceed 1,000 feet. Both stations occupy the summits of hills belonging to what are now called the "Lower Himalayas," and these hills stand at no great distance from the plains. From the situation of Chuckrata and Raneekhet, the explanation I would offer of the barometric peculiarity is, that during the hotter hours of the day a large portion of the air is lifted up from the plains to levels far above them, and thus, from being below, becomes above the barometer at the higher places, and neutralises to a large extent, although it does not extinguish, the usual depression which occurs towards 4 o'clock in the afternoon. It might be argued on this that an opposite process is at work during the night; the cooling then would be attended by a flow of air from the hills downwards to the plains, and that thus the barometric maximum at 10 hours should be as much lessened as the 16 hours minimum, and thus relatively no difference should appear. No doubt the downward flow takes place; but then the 10 hours maximum is generally believed not to be owing to movement of the dry air so much as a sudden increase of the aqueous vapour, the addition of the elastic force of which would account for the high barometer so constantly noticed, and the addition to the general air of aqueous vapour can take place in the hills as well as in the plains.

Means of the Maximum in Shade.

Place and year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Chuckrata, ... 1872,	57	56	63	65	73	76	70	70	69	65	64	62
1871,	54	56	63	70	69	72	70	69	70	71	62	59
1870,	56	59	60	71	81	77	70	69	70	71	65	55
1869,	...	...	57	74	84	81	74	71	69	67	62	58
1868,												
Mean,	56	57	61	70	77	76	71	69	69	68	63	58
Raneekhet, ... 1872,	55	56	71	73	81	80	71	75	74	71	66	61
1871,	62	62	68	75	74	76	74	71	75	73	67	59
Mean,	58	59	69	74	77	78	72	72	74	72	66	60
Dehra, ... 1872,	64	68	83	86	93	93	85	84	84	82	76	70
1871,	68	73	81	89	90	88	85	85	86	83	77	70
1870,	68	73	76	85	97	93	85	84	83	83	75	69
1869,	68	70	72	88	99	98	87	86	83	80	73	69
1868,	65	66	76	86	93	92	90	90	89	85	78	70
Mean,	66	70	77	86	94	93	86	86	85	82	76	69

Roorkee,	1872,	66	72	88	94	103	100	90	90	90	90	83	75
	1871,	71	78	87	97	97	94	89	89	92	91	83	72
	1870,	73	75	82	94	107	101	92	91	91	91	83	74
	1869,	71	74	80	97	110	107	94	94	90	87	80	76
	1868,	69	70	80	96	101	101	96	98	98	94	85	74
	Mean,	70	74	83	95	103	100	91	92	92	90	83	74
Meerut,	1872,	67	74	91	98	105	104	93	94	92	91	85	75
	1871,	70	80	90	99	98	96	90	91	94	96	85	73
	1870,	74	81	87	97	108	101	93	93	92	95	87	76
	1869,	73	77	83	100	112	108	96	97	92	89	82	75
	1868,	...	...	...	...	...	...	...	...	...	...	...	...
	Mean,	71	78	88	98	106	102	93	93	92	93	85	74
Bareilly,	1872,	68	74	92	98	106	101	92	91	90	90	84	76
	1871,	70	76	89	98	99	96	90	90	92	93	85	73
	1870,	73	80	87	96	107	102	92	92	90	92	83	75
	1869,	73	78	84	101	111	108	97	96	91	86	81	74
	1868,	...	...	...	99	100	90	97	98	96	95	88	76
	Mean,	71	77	88	98	104	99	93	93	92	91	84	75
Agra,	1872,	68	75	93	99	106	105	92	87	89	91	84	75
	1871,	70	80	92	100	100	95	87	86	88	93	84	72
	1870,	72	82	86	96	108	101	94	88	89	92	84	77
	1869,	73	77	84	101	112	110	94	94	88	83	80	73
	1868,	69	75	86	99	105	101	98	95	98	96	87	76
	Mean,	70	78	88	99	106	102	93	90	90	19	84	74

MEANS OF THE MAXIMUM IN SHADE.—(*concluded.*)

Place and year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Futtehgurh, 1872,	68	76	94	97	104	104	91	88	90	91	84	77
1871,	71	79	92	101	100	96	89	87	91	96	87	74
1870,	74	82	88	95	108	102	93	90	89	92	84	75
1869,	73	79	83	103	110	108	95	95	90	87	82	74
1868,	...	...	...	98	102	104	...	98	93	95	87	76
Mean,	71	79	89	99	104	103	92	91	90	92	85	75
Lucknow, ... 1872,	71	78	95	101	107	104	95	92	93	94	87	80
1871,	74	81	92	102	101	97	90	92	90	96	88	77
1870,	76	84	91	100	109	103	93	92	90	92	85	78
1869,	77	84	90	106	113	109	95	95	92	88	83	77
1868,	72	78	90	101	103	98	97	98	90	96	83	79
Mean,	74	81	91	102	106	102	94	94	91	93	86	78
Allahabad, ... 1872,	69	77	93	98	104	100	90	88	88	91	85	78
1871,	73	81	91	100	95	95	88	87	87	91	85	75
1870,	76	84	92	101	111	104	91	88	89	89	81	75
1869,	...	...	89	103	105	...	...	96	92	89	84	77
Mean,	72	80	91	100	104	99	89	89	89	90	84	76

Benares, ...	1872,	73	78	95	99	105	101	91	90	79	91	85	78
	1871,	77	84	92	101	100	97	90	89	90	94	88	77
	1870,	78	86	94	103	111	105	96	96	92	95	86	78
	1869,	78	86	94	106	114	109	96	99	95	91	86	79
	1868,	...	...	...	...	107	100	101	97	98	94	87	79
	Mean,	76	83	94	102	107	102	95	94	93	93	86	78
Goruckpore,	1872	67	75	92	97	98	96	90	89	89	89	84	77
	1871,	73	80	89	98	92	94	84	87	86	89	83	74
	1870,	74	72	86	96	103	98	89	89	88	88	81	74
	1869,	74	82	89	101	104	93	91	88	89	86	81	75
	1868,	75	...	...	...	98	97	96	97	92	92	84	...
	Mean,	72	77	89	98	99	95	90	90	88	88	82	75
Jhansie, ...	1872,	76	81	96	103	108	108	94	88	92	94	94	82
	1871,	75	85	95	105	104	97	86	87	91	99	94	72
	1870,	77	83	91	102	111	103	93	92	90	92	88	79
	1869,	77	83	90	105	113	112	95	95	90	88	82	81
	1868,	72	79	88	101	108	104	97	94	97	99	90	79
	Mean,	75	82	92	103	108	105	93	91	92	94	89	78
Ajmere, ...	1872,	64	79	95	100	105	108	88	88	93	95	89	86
	1871,	66	75	87	97	93	89	38	82	87	90	72	69
	Mean,	65	77	91	98	99	98	46	85	90	92	80	77

MEANS OF THE MINIMUM IN SHADE.

Place and year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Chuckrata, ... 1872,	34	35	50	50	58	63	61	61	57	50	45	40
1871,	38	40	44	50	52	60	62	60	57	51	45	40
1870,	41	43	43	51	60	62	61	60	57	54	49	37
1869,	...	...	42	55	64	64	61	61	59	52	46	42
Mean,	37	39	45	51	58	62	61	60	57	52	46	39
Raneekhet, 1872,	39	39	52	53	60	64	62	62	60	55	48	43
1871,	43	45	48	54	55	62	62	62	60	57	49	43
Mean,	41	42	50	53	57	63	62	62	60	56	48	43
Dehra, ... 1872,	46	46	57	62	70	75	73	74	70	59	52	47
1871,	43	51	54	63	69	75	74	73	71	60	50	46
1870,	43	48	53	60	71	76	74	73	69	62	51	44
1869,	44	46	53	61	73	77	74	73	71	59	48	44
1868,	41	44	50	60	67	73	72	72	69	57	50	44
Mean,	43	46	53	61	70	75	73	73	70	59	50	45
Roorkee, ... 1872,	47	49	57	66	72	79	77	76	73	60	51	45
1871,	43	53	53	65	73	78	78	77	74	60	49	44
1870,	41	49	55	63	74	80	78	77	73	64	48	42
1869,	44	57	58	65	77	82	78	78	76	62	47	43
1868,	44	50	55	65	72	80	78	80	75	60	49	44
Mean	43	51	55	65	73	79	78	77	74	61	49	43

Meerut, ...	1872,	46	48	58	67	74	81	78	77	73	60	51	45
	1871,	43	54	55	66	73	78	77	77	75	62	52	45
	1870,	42	50	58	64	76	80	79	77	74	64	49	44
	1869,	45	47	48	56	71	77	70	70	68	54	40	36
	Mean,	44	49	55	63	73	79	76	75	72	60	48	42
Bareilly, ...	1872,	48	48	61	69	74	80	79	79	76	64	55	48
	1871,	44	54	56	66	74	78	77	77	76	64	54	46
	1870,	44	54	60	66	75	81	78	77	75	68	50	44
	1869,	46	52	60	68	82	84	79	79	76	65	51	46
	1868,	...	...	...	70	72	80	79	81	76	63	51	46
	Mean,	45	52	59	67	75	80	78	78	76	65	52	46
Agra, ...	1872,	51	53	66	78	82	87	82	79	76	67	58	52
	1871,	47	57	62	72	79	80	78	77	75	68	60	50
	1870,	46	53	61	70	81	84	81	77	76	71	55	50
	1869,	49	54	62	74	88	90	81	73	77	66	54	50
	1868,	45	52	60	72	78	82	83	80	80	70	57	51
	Mean,	47	54	62	73	81	84	81	78	76	68	57	50
Futtehgurh,	1872,	47	50	63	72	79	83	80	80	77	65	55	49
	1871,	45	53	58	68	74	79	77	77	75	65	57	47
	1870,	44	50	59	66	76	78	79	77	75	68	51	46
	1869,	45	51	61	69	82	86	78	79	77	65	51	47
	1868,	...	...	...	63	73	82	...	80	77	65	53	46
	Mean,	45	51	60	67	76	81	78	78	76	65	53	47

MEANS OF THE MINIMUM IN SHADE.—(*continued.*)

Place and year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Lucknow, ... 1872,	47	48	61	69	77	89	80	79	76	63	53	46
1871,	46	53	60	68	78	79	79	79	76	65	57	47
1870,	46	50	61	67	80	83	80	79	77	70	51	45
1869,	45	51	61	73	85	86	81	80	78	67	51	46
1868,	46	55	60	71	75	83	83	82	79	64	52	46
Mean,	46	51	60	69	79	84	80	79	77	66	53	46
Allahabad,... 1872,	55	53	64	68	77	82	78	77	77	65	55	49
1871,	46	53	58	67	75	78	79	78	77	68	58	50
1870,	46	51	65	68	77	81	77	76	75	69	54	56
1869,	...	...	68	...	...	...	...	79	78	67	53	49
Mean,	49	52	64	68	76	80	78	77	77	67	55	48
Benares, ... 1872,	...	50	64	71	78	83	80	80	79	69	55	50
1871,	42	50	54	65	73	77	75	74	73	63	53	45
1870,	41	46	56	63	73	78	74	75	74	66	49	40
1869,	42	49	58	70	81	82	77	77	75	63	47	43
1868,	45	49	...	...	73	79	80	78	76	60	49	42
Mean,	42	49	58	67	75	79	77	78	75	64	50	44

Goruckpore,	1872,	52	52	63	71	75	79	79	79	78	70	61	54
	1871,	44	52	53	65	68	73	71	71	66	60	49	41
	1870,	47	50	60	67	74	77	76	75	74	69	55	44
	1869,	49	55	63	73	83	81	76	75	77	69	55	51
	1868,	39	...	...	...	75	82	80	81	78	67	58	...
	Mean,	48	52	60	69	75	78	76	76	74	67	55	47
Jhansie, ...	1872,												
	1871,	51	55	65	75	81	86	79	77	77	...	...	...
	1870,	49	57	63	73	78	75	76	74	73	68	...	56
	1869,	46	57	66	71	82	82	79	75	74	69	57	52
	1868,	51	56	64	76	87	89	78	79	77	65	54	52
		48	55	69	72	80	83	81	78	78	69	60	52
	Mean,	49	56	65	73	81	83	78	77	76	67	57	53
Ajmere, ...	1872,	45	48	61	71	78	83	78	75	73	62	53	48
	1871,	44	53	62	71	77	79	75	73	74	67	59	48
	1870,	42	51	61	69	80	80	78	74	74	69	54	51
	1869,	45	53	58	71	84	83	78	77	73	63	51	48
	1868,	42	51	57	69	77	80	79	75	77	67	55	47
	Mean,	43	51	59	70	79	81	77	75	74	65	54	48

In the remarks which have been already made on the temperature charts, the course of the temperature during last year has been explained, and the same explanation applies to the means given in the above tables; the heat rises rapidly in the first three months, then through April and May increasing at a much less rate, but still remaining high. During June, July, August, and September the heat only decreases a very little; but in October, November, and December the decrease is as rapid as was the increase in January, February, and March.

The differences in temperature in the stations on the plains are more striking in the cold than in the hot weather; the cause of this is most probably, as was stated in a former report, the prevailing wind. The west wind of the dry hot period, and the south-east of the rains, have both a warm source, and in blowing over the area meet with no conditions which would tend to alter their temperature. On the other hand, the north-westerly wind of the cold weather is a cold wind at first, and gradually warms as it meets the denser air of the lower parts of the country.

An attempt to draw isothermal lines over a map of the North-Western Provinces, on the basis of the above means, has not been very successful, when the correction for height above sea-level was applied. The area was found too limited to afford a sufficient progression of temperature.

Annual and Monthly Total Rainfalls.

Place and year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Chuckrata, 1872,	0·90	1·46	2·03	1·18	2·52	3·93	17·75	13·50	3·95	...	...	·46	47·58
1871,	...	...	...	·89	5·46	15·94	25·20	19·24	4·62	...	...	·121	72·56
1870,	·40	1·19	6·27	2·67	·20	10·75	16·30	11·77	6·24	·72	...	...	57·22
1869,	...	...	11·92	·60	·05	3·72	8·85	4·07	10·30	·77	...	·195	42·23
Mean,	·65	1·68	6·74	1·33	2·05	8·58	17·07	12·14	6·18	·74	...	·121	54·90
Raneekhet, 1872,	3·64	3·15	0·34	2·99	1·44	9·72	9·09	15·89	8·46	...	0·60	·59	55·91
1871,	1·20	4·20	...	·50	5·70	9·50	12·80	9·70	4·20	...	...	2·45	50·25
Dehra, ... 1872,	6·60	2·26	0·55	1·29	1·36	12·05	31·85	22·85	14·83	...	...	·20	93·84
1871,	·46	2·55	...	·43	3·48	24·39	36·38	38·46	11·09	...	...	1·32	118·56
1870,	·03	1·40	4·16	1·85	·31	7·08	33·13	28·50	13·81	1·39	...	·01	91·67
1869,	1·67	1·43	7·27	·11	...	2·98	20·69	16·85	22·62	2·41	...	1·22	77·25
1868,	2·71	7·30	1·80	·85	·82	6·85	21·30	12·88	3·04	·05	...	·18	57·78
Mean,	1·89	2·99	3·44	·90	1·44	10·33	28·67	23·91	13·40	1·28	...	·58	87·82

Annual and Monthly Total Rainfalls.—(*continued.*)

Place and year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Roorkee, ... 1872,	4·02	1·55	0·14	0·22	0·93	3·94	15·42	19·77	7·14	...	...	·38	53·51
1871,	1·02	3·12	...	·10	1·82	14·42	20·80	14·20	1·98	...	...	·82	58·28
1870,	...	1·06	2·30	·93	·19	4·94	14·60	12·96	6·34	·71	...	...	44·03
1869,	1·94	1·35	3·24	...	...	2·43	8·04	6·91	9·04	1·16	...	1·00	35·11
1868,	7·89	4·42	1·13	·30	1·26	4·24	10·81	1·43	1·09	...	...	·11	26·68
Mean,	2·22	2·30	1·70	·38	1·05	5·99	13 93	11·05	5·12	·93	...	·58	43·40
Meerut, ... 1872,	3·10	0 90	...	0 40	0·20	3·07	8·85	8·86	5·90	...	...	·58	31·86
1871,	1·10	2·17	...	1 00	3·73	6·85	9·79	5·85	1·15	...	...	1·80	33·44
1870,	...	...	1·93	·85	·75	12·55	9·48	8·16	3·95	...	...	...	37·67
1869,	·85	·48	1·89	...	...	·25	7·60	3·39	3·83	·50	...	·25	19·04
1868,	...	...	...	...	...	1·90	8·83	·20	·10	...	...	...	11·03
Mean,	1·68	1·17	1·91	·75	1·56	4·92	8·91	5·29	2·98	...	...	·87	26·51
Bareilly, ... 1872,	1·65	1·05	1·05	0·10	0·95	10·60	17·35	9·15	5·35	...	...	·25	47·50
1871,	2·10	·95	...	1·20	2·10	10·75	20·15	6·15	2·20	...	...	1·85	47·80
1870,	...	·60	2·10	·50	·85	14·20	10·00	8·55	12·95	1·15	...	·35	51·25
1869,	·85	·20	1·70	·10	...	·60	·845	5·58	19·91	3·50	...	1·40	42·29
1868,	...	...	...	·45	1·75	5·75	9·65	·60	4·30	...	...	...	22·50
Mean,	1·52	·70	1·62	·47	1·41	8·38	13·12	6·07	8 94	2·22	...	·96	42·27

Agra, ...	1872,	1·59	0·16	...	0·40	1·10	1·58	5·04	8·60	4·67	...	...	·23	23·37
	1871,	1·60	·27	...	·42	2·37	5·76	8·94	9·28	4·06	...	...	·98	33·68
	1870,	·10	...	3·10	·35	...	4·30	9·38	7·05	·56	...	...	·27	25·11
	1869,	·90	·35	·80	...	...	·20	6·00	2·50	12·10	3·70	...	·80	27·35
	1868,	·70	·15	·10	...	·30	1·80	12·50	1·30	·17	...	...	...	17·02
	Mean,	·94	·23	1·33	·39	1·25	2·73	8·37	5·70	4·31	...	...	·57	25·30
Futtehgurh,	1872,	1·84	0·15	0·83	0·10	0·30	4·00	16·55	9·50	1 43	...	...	...	34·70
	1871,	·70	·45	...	·15	1·65	5·02	10·27	5·47	1·05	...	...	1·00	25·76
	1870,	...	...	·87	·20	1·00	9·10	8·70	11·75	6·75	...	...	...	38·37
	1869,	·22	...	·45	...	...	·10	14·05	4·02	9·72	3·85	...	1·50	33·91
	1868,	...	...	...	...	·52	·35	...	3·51	5·11	...	...	...	9·49
	Mean,	·92	·30	·72	·15	·87	3·71	12·39	6·85	4·81	...	...	1·25	28·44
Lucknow,	1872,	1·61	0·53	...	0·52	0·68	1·76	9·87	22·77	3·26	...	...	...	41·00
	1871,	1·23	...	...	...	1·50	10·77	20·57	5·11	20·16	...	...	2·11	61.45
	1870,	...	...	1·67	·71	...	9·83	15·81	18·36	17·16	2·44	...	...	65·98
	1869,	·17	...	·48	...	...	·19	16·86	5·52	13·16	4·11	...	1·43	41·92
	1868,	·35	·25	·26	·97	2·29	3·34	8·90	3·70	8·01	...	...	...	27·17
	Mean,	·84	·36	·80	·43	1·49	5·18	14·50	11·09	12·35	3·18	...	2·77	47·50
Allahabad,	1872,	2·10	0·22	...	...	...	...	11·18	25·32	5·36	...	...	...	44·78
	1871,	...	...	...	1·10	·74	15·48	24·99	7·36	11·81	...	...	1·51	62·99
	1870,	...	...	·93	·79	...	4·18	16 50	16·86	...	10·28	...	...	49·84
	1869,	...	...	...	...	...	...	...	7·15	18·30	15·52	...	·45	41·42
	1868,	...	...	·18	·17	·03	4·18	6·12	·79	...	...	...	...	11·47
	Mean,	...	...	·55	.68	·38	8·04	14·70	11·61	11·82	12·90	...	.98	42·10

ANNUAL AND MONTHLY TOTAL RAINFALLS.—(*concluded.*)

Place and year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Benares, ... 1872,	1·65	·40	...	...	·30	5·00	13·70	8·60	4·08	...	...	...	33·73
1871,	...	·20	·55	1·25	·70	8·53	14·40	14·75	13·51	...	...	1·25	55·14
1870,	...	·18	·46	·30	...	4·00	19·55	9·10	7·25	5·37	...	...	46·21
1869,	·05	·43	...	·38	...	3·60	12·75	6·92	9·92	4·90	...	...	38·95
1868,	·72	·15	·35	·60	·21	10·10	9·75	4·05	5·85	...	...	...	31·78
Mean,	·81	·27	·45	·63	·40	6·23	14·03	8·68	8·12	5·05	...	...	41·16
Goruckpore, 1872,	2·00	·50	·30	·40	2·50	4 40	23·40	11·55	19·50	...	...	...	64·55
1871,	·20	·50	·10	·10	5·85	8·80	23·60	21·00	19 00	...	...	·90	80·05
1870,	...	·10	·30	·40	1·30	4·70	20·10	15 90	8·30	3.10	...	...	53 50
1869,	...	...	·20	...	·20	1·05	6·20	12·50	9·70	10·50	...	·20	40·55
1868,	...	...	...	...	·90	3·28	9·10	6·00	2·10	...	...	...	21·38
Mean,	1·10	·55	·22	·22	2·45	4·44	16·48	13·25	11·72	6·80	...	·55	52·00
Jhansie, ... 1872,	·40	·20	...	...	·50	2 70	15 60	15·80	·80	...	...	...	36·00
1871,	1·80	·40	...	·20	1·30	4·85	6·92	11·40	6·90	...	...	·85	34·62
Ajmere, ... 1872,	·30	...	...	...	1·20	1·23	7·57	18·15	3·35	...	...	·15	31·95
1871,	...	...	...	...	1·12	8·20	6·65	·55	4·25	...	·90	...	21·67

The monthly means given in the above table are the result of dividing the totals by the number of months in which a rainfall was recorded. I have adopted this mode with some hesitation, for, strictly speaking, such is not the true mean, which ought to be obtained by dividing by the sum of all the months; yet it appeared to me that, with the small number of months dealt with a juster estimate of the rainfall would be shown by leaving out in the division those in which there had been no rainfall. This remark does not apply to the annual means, nor does the mode affect the means of the months in the rainy season, which are all true means.

The distribution of the rainfall in the North-Western Provinces was remarked upon in last report, and the means given in the above table are additional illustrations to what was then said. The tract of country nearer to the Himalayas is where the largest precipitation takes place, as the high numbers of Dehra, Roorkee, Bareilly, Goruckpore, and Lucknow, show. The area of the next greatest precipitation is the most eastern, represented by Benares and Allahabad. In the central, south-west, and south-western areas, represented by Futtehgurh, Meerut, Jhansie, Agra, and Ajmere, the amount of rain is decidedly less. The cause of this seems to be that the monsoon current, which, as already stated, is from the east or south-east, has discharged already a large part of its moisture before it reaches Futtehgurh, Meerut, and Agra. This at least is the case with the lower strata of the current. The upper strata retain the greater part of their moisture until they meet the hills. It is the very outermost range of these which receives the greatest discharge, as may be seen from the rain fall of Raneekhet, which is situated a little way into the interior and has some high hills between it and the plains. The same cause also accounts for the lower rainfall of Ajmere, as it lies to the north and east of the Aravalli range, which intercepts a large part of the moisture of the south-west wind.

The system of winds which prevails in this part of India is nearly the following.

In the stations to the north and west, in the cold weather, north-west and westerly winds are most frequent. In places more in the centre of the area, and in the eastern part of it, the winds are westerly, with much less of the northerly element. In Ajmere and Jhansie north and easterly elements are more abundant. In the dry hot weather, April, May, and part of June, the hot west winds are characteristic of the weather in the plains. Those hot winds begin at 9, 10, 11 hours, and usually die down at sunset. In Roorkee I have many times observed that the winds at this season go round with the sun, beginning in the east in the early morning, and gradually veering southwards, and settling in an almost due west direction at 14 or 15 hours. The wind, as this description implies, usually travels from east to west quicker than the sun.

In the rainy season the winds at the central and more easterly stations are east or south-east, and at those further north and west, like Bareilly, Meerut, Agra, and Roorkee, the winds are south-east, while in Jhansie and Ajmere they are south-west. This south-east wind is what corresponds in the North-Western Provinces to the south-west monsoon of the Indian Ocean and the Bay of Bengal. From the south-west direction it has in the latter, it is changed to an east in the interior, because the only way it can travel up-country is by the Gangetic valley; and the wind acquires more of a southerly element the further it goes from the directive action of the mountain chains, especially of the Himalayas, the trend of which is north-west and south-east. At Jhansie and Ajmere the monsoon retains its original direction. This may be partly owing to the relative high altitude of these places as well as their situation, which, at least in the case of Ajmere, is quite out of the reach of the wind travelling up the Ganges. But from the position of the

Aravalli range to the south-west of Ajmere, it is not easy to see why the monsoon should preserve its original direction so constantly.

The south-east wind is always a moist wind in Upper India, even in the cold weather. It never blows for two or three days together but signs of increasing humidity make their appearance, often in the form of rain, still more often in the form of clouds. In by far the majority of cases the cold-weather rain is preceded or accompanied by a south-east wind.

2.—*From* C. A. ELLIOTT, ESQ, *Secretary to Government, North-Western Provinces, to* M. THOMSON, ESQ., *Reporter on Meteorological Observations, North-Western Provinces,* (No. 1822A).—*Dated Nynee Tal, the 26th August,* 1873.

I have the honor to acknowledge the receipt of your No. 130, dated the 16th April, 1873, forwarding the report on the meteorological observations taken in the North-Western Provinces during the year 1872; and to communicate the following remarks and orders thereon.

2. Your annual inspection of instruments and observatories has already been separately reported to Government. With the exception of Goruckpore, where, in consequence of an escape of mercury from the barometer, the observations for a great part of the year were worthless, the instruments were generally found in good order.

3. The Lieutenant-Governor notices with satisfaction your statement that the native observers (who are in most cases Hospital Assistants) were found "able, in point of knowledge, for their work." His Honor trusts that they have been found to evince care and accuracy also. Constant vigilance is, however, required to be exercised in this direction, both by yourself in comparing and testing the returns,

and by the Civil Surgeons who are Superintendents of Observatories, and who should frequently inspect the work of the observers at irregular times.

4. The charts and tables appended to your report, and also the monthly remarks on barometric pressure and weather, are very pains taking, and contain much that is of interest; but the Lieutenant-Governor misses the endeavour to treat the Province as a whole. The observations carefully noted for each station are not gathered up into one view, and little is said in the way of comparing and tracing the connection of temperature and atmospheric pressure at different places. And in other respects the year is not treated as a whole, *e. g.*, the barometrical results on pages 5, 6, and 7, and the thermometrical on pages 8 to 15, are given for each month separately, but not totalled, nor the means struck for the whole year.

5. The main defect in the report, however, in the Lieutenant-Governor's opinion, is the failure to compare the meteorological observations with the contemporaneous atmospheric and seasonal phenomena presumably influenced by them. Without attempting to draw hasty conclusions as to cause and effect, it is important that a careful and complete record of these phenomena should be kept up so as to elucidate the mutual connection of atmospheric pressure, temperature, and moisture, and their relation to the weather. For instance, the fall and distribution of the rains being the most important event of the year for the welfare of the country, a full account of it should be given in the report. It should be stated by what atmospherical conditions the setting-in of the rains was preceded, and how many days in advance the wet bulb, or the variations of pressure, indicated its coming; where and on what dates the rain-storm first broke, and how long it took in reaching the various Provinces or districts from the south-east; how the fall was distributed throughout the rainy months; how many rainy days there were; what variations subsequently

occurred in the direction of the monsoon; and whether rain fell in penetrating showers that soaked the earth, or in a heavy down-pour which ran off the surface. Similarly, the occurrence of hail-storms (another phenomenon closely affecting agriculture) should be recorded, and any contemporary change in the barometric pressure. The course of any great hail-storm, like that of Muttra in 1870, and of Furruckabad in 1871, should be traced out. The falls of snow in the hills, with dates of the earliest and latest falls, might also be noted. And in respect of all these phenomena, the observations of the year under report should, as far as materials are available, be compared with those of previous years.

6. In your general summary you remark that there was nothing unusual to record during the year 1872, and that the weather was altogether very normal. This may possibly be true as far as the scientific observations of meteorologists are concerned; but it is certainly very far from the truth as regards the phenomena that most nearly touch agricultural operations. The great humidity of the early part of 1872, which well nigh ruined the spring crop, and the very early cessation of the rains in September, which, added to the absence of rain in December 1872, damaged the same harvest of the current year (1873), made it, in that respect at any rate, a very abnormal season.

7. The table in which you give the means of humidity is interesting, although your report shows only the monthly, and not the total figures of the year. Working these out, the stations stand thus in order:—

		Average monthly means.
1.	Chukrata, ...	66·5
2.	Goruckpore, ...	60·5
3.	Dehra, ...	60·2
4.	Bareilly, ...	58·
5.	Raneekhet, ...	57·2
6.	Meerut, ...	54·5

		Average monthly means.
7.	Agra, ...	53·8
8.	Lucknow, ...	53·6
9.	Allahabad, ...	53·4
10.	Roorkee, ...	53·2
11.	Benares, ...	52·5
12.	Futtehgurh, ...	49·9
13.	Jhansie, ...	45·6
14.	Ajmere, ...	44·5

It is noticeable how much more moist Chukrata was than Raneekhet; and it might have been expected that Benares and Roorkee would have been found higher up, and Agra lower down in the scale. In future reports the position of each station should be similarly recorded, and compared with that shown in previous years.

8. The rains of 1872 appear to have been on the whole lighter and more evenly distributed than those of 1871, and (as before remarked) they ended earlier. But the provincial averages of the two years are not given by you. At Raneekhet, Futtehgurh, Jhansie, and Ajmere, the rain-fall was heavier than in 1871; elsewhere it was lighter. The stations stand thus in 1872:—

		Total rain-fall.	
		By Report.	*By Board's returns.*
1.	Dehra, ...	93·84	81·9
2.	Goruckpore, ...	64·55	68·2
3.	Raneekhet, ...	55·91	...
4.	Roorkee, ...	53·51	48·5
5.	Chukrata, ...	47·58	...
6.	Bareilly, ...	47·50	56·0
7.	Allahabad, ...	44·78	42·0
8.	Lucknow, ...	41·0	...
9.	Jhansie, ...	36·0	34·9
10.	Futtehgurh, ...	34·70	33·1

		Total Rain-fall.	
		By Report.	*By Board's returns.*
11.	Benares, ...	33·73	31·2
12.	Ajmere, ...	31·95	...
13.	Meerut, ...	31·86	29·1
14.	Agra, ...	23·37	26·0

This makes Raneekhet more rainy than Chukrata, but it was the reverse last year, and we have only two years' returns for Raneekhet, so that no general conclusion can be drawn from this table.

9. The want of correspondence in the above results, as compared with the humidity table in para. 7, is very noticeable. Meerut and Agra, for example, which stand lowest of all for actual rain-fall, are 6th and 7th in respect of humidity. Jhansie and Ajmere again, which stand last of all in respect of humidity, are 9th and 12th in this list.

10. The Lieutenant-Governor is disappointed to find that you have not been able to undertake the work of collating the rain-fall returns, prepared under the orders of the Board of Revenue, with those of your own observers. No doubt your plea of want of leisure must to a certain degree be admitted; but His Honor thinks that even a few hours spent by you in comparing your results with those finally brought out by the Board might have elicited useful information; and in future I am to request that you should at least notice the revenue returns, however briefly you may be able to do so. It is highly desirable that the two sets of observations should be collated month by month: and it would eventually lead to a greater degree of accuracy than is at present attained. It is true that the rain-fall even in places near to one another is often extremely variable. Still where the variations at adjoining stations are very large, a presumption of error arises; and enquiry into it might lead to the detection of error and the correction of its cause.

11. With reference to your remark about the advantage of publishing weekly instead of monthly reports, His Honor has noticed that the observations taken at Allahabad are now published daily in the local paper. This example might perhaps be followed with advantage in respect of other observing stations, and the results of the observations of your department would thus be put more widely within the reach of the public than were they published, as desired by you, every week in the official *Gazette*.

12. The total expenditure shown last year was Rs. 10,800. This year it is Rs. 11,355. This statement should in future be accompanied by the attestation of the Account Department that their figures agree with yours, and the Accountant-General will be addressed on the subject.

Art. XXXIII.

OPERATIONS OF THE BOOLUNDSHUHUR MODEL FARM DURING RUBBEE HARVEST OF 1872-73.

1.—*From* F. M. LIND, ESQ., *Commissioner, Meerut Division, to* C. A. ELLIOTT, ESQ., *Secretary to Government, North-Western Provinces (Docket No. 94).—Dated the 25th August,* 1873.

SUBMITS, for the information of Government, Collector's letter No. 414, dated 6th instant, giving cover to report, with its accompaniments, from the Superintendent in charge of the farm.

2.—*From* H. D. WILLOCK, ESQ., *Collector of Boolundshuhur, to* F. M. LIND, ESQ., *Commissioner, Meerut Division (No. 414).—Dated Boolundshuhur, the 6th August,* 1873.

I HAVE the honor to forward the report from the Superintendent of the Cotton Farm for the rubbee harvest of the past year.

2. The season commenced favourably. The lands throughout the district were in good order for sowing, and, had the winter rain fallen heavily, the harvest would have been a remarkably fair one. Very little rain fell in the district, and the outturn all round was below the average. The farm lands had the advantage of receiving an ample supply of water, and the crops were consequently heavy.

3. The cultivation was as follows:—

	Acres.	R.	P.
Wheat	... 35	2	18
Barley	... 25	1	17
Oats	... 5	2	0
Peas	... 8	2	15
Gram	... 9	3	10

	Acres.	R.	P.
Mixed crops (gram and barley) ...	5	0	10
Root crops	1	3	15
Tobacco, potatoes, &c.	2	0	10

Of this 57 acres 2 roods 10 poles was turned up with the English plough, the remainder being grubbed up after the native fashion. The Superintendent's returns give a detailed statement of the outturn of the different varieties of wheat and other crops, and it will be seen that, as usual, the deep-ploughed and manured lands give the heaviest crops.

The yields per acre were as following :—

	Average.			*Highest.*		
	M.	s.	c.	M.	s.	c.
Wheat	13	28	0	16	25	0
Barley	13	0	0	16	6	8
Oats	17	30	0		...	
Peas	15	6	0	15	24	0
Gram	16	13	0		...	
English barley	12	11	0		...	

The red and white unbearded wheat give the fairest yield and the greatest proportion of grain to straw. They are the most popular wheat among the cultivators, being the hardiest and most profitable. The "long bearded white," known as *buddha*, makes a magnificent show wheat on account of the length of stalk and size of head, but the grain grinds gritty and is small in weight compared to that of the straw. It ripens late, and requires extra care and waterings, and is not a favourite. It is only grown on the farm as a specimen wheat. The oats are much sought after, and I have induced some of the members of our local Agricultural Association to encourage the growth of the grain in their villages. The whole of the outturn has been sold to landholders, a large portion having gone into the Allygurh District, and I expect the Haupper Stud will obtain large supplies in future from this district.

The root crops succeeded but poorly. They were considerably damaged early in the season by locusts, and others were forced badly, as will be seen by Mr. Simpson's remarks.

The tobaccos were carefully tended by Mr. Simpson, but the want of store-rooms prevented the preparation of the leaves, and nothing was effected beyond the fact established that the foreign tobaccos turn exceedingly well in the climate, and the preservation of seed for future sowings. The farm has no shelter for its ploughs and other implements, and until the Superintendent is fairly provided with the ordinary conveniences which every cultivator possesses, he cannot be expected to command that success which is looked for.

4. Mr. Simpson has been very successful in the care of his stock. The farm was threatened with rinderpest during the last three months, the disease having appeared in a village some two miles distant. The village lands adjoin those of the farm, and as the cattle passed our farm buildings by a public road, considerable anxiety was felt for some time on the subject. I took measures enforcing the segregation of the diseased cattle of the infected village, and supplied remedies for sick cattle, and the disease did not spread. The flock of sheep are thriving amazingly. The rams are half-bred South Downs, fine, strong, young animals. The ewes have been selected from local flock, and have thrown some very fine lambs by the South Downs. The crop promises remarkably well, and a great desire is expressed by sheep-breeders for sheep for a stock for breeding. I only regret that I have been unable, for want of funds, to increase the number of the flock.

5. On the whole the harvest was a light one, as will be seen by a comparison with the outturns of the previous year. The winter rains failed, as otherwise the harvest throughout the district would have proved a remarkably fine one. It is impossible to draw a comparison between the farm outturns and those of cultivators, save by inspection of standing crops, as the cultivator's produce is never, and never has been fairly weighed. As a rule, the outturn given by a cultivator is the

acknowledged outturn only, *i. e.*, that left on the threshing floor after the payment of fees to village hereditary servants and daily abstraction of portions for household current requirements. The straw is never weighed, and the whole harvest returns are mere guess-work. The superiority of the farm crops, the result of selection of seed and careful farming, was proved at the local Agricultural Exhibition, where seventeen prizes were awarded to the farm.

6. The numerous discussions on farming topics which have followed the establishment of the farm induced me to hold an Agricultural Exhibition in the spring of this year. The proposal was eagerly responded to, and the meeting was a most successful one. The fact of the farm receiving seventeen prizes is alone sufficient to prove that during the short time that it has been established much has been done by careful farming and selection of seed to improve the varieties of the district crops. The bulk of the outturn is sold to traders, but large quantity of grains of all kinds are purchased by cultivators for sowing purposes, and much good has resulted. The care shown by Mr. Simpson in his general management of the farm, his fine show of produce at the Exhibition, the ability displayed by him in arranging the Agricultural Department for the show, and his willingness to assist all enquiries, have rendered him very popular, and our farm operations and the Exhibition have opened up a spirit of enquiry which is fast leading to important results. I am convinced, therefore, that the Boolundshuhur Farm will prove to be of most important benefit to the district. The subscribers to the Exhibition have formed themselves into an Agricultural Association, and it is intended to hold an annual meeting similar to that of this year. It is impossible that the result of such institutions should be shown at once. The seed sown will germinate and come up in good time, but at once we have pleasant social meetings of all classes. The members of the Association have resolved to make good use of the funds in their hands, and it is proposed to purchase and place under the care of the Superintendent of

the farm some first-class bulls for breeding purposes. They are much required, and if the scheme answers, others will be stationed, at the expense of the Association, in various parts of the district. Other schemes are on hand for the advancement of agricultural pursuits.

7. The financial statement of the farm for the year may be given as follows:—

	Rs.	a.	p.
Cost of the working of the farm	6,990	11	8
From this should be deducted the following items :—			
Sundry works	108	14	0
Implements	196	6	0
Carriage of ditto	30	1	0
Tools	57	7	9
Buildings	33	0	3
Roads	10	0	0
Wells	202	5	0
Stock, cattle and sheep	110	10	0
Salary of Sudder Mohurrir	60	0	0
Travelling expenses of Superintendent ...	22	8	0
Books for Farm Library	72	1	0
Total Rs. ...	903	5	0

This gives the cultivating cost as Rs. 6,087-6-8; the value of the outturn is Rs. 4,210-5-11, leaving a cost to Government of Rs. 1,877-0-9, or Rs. 156 per mensem. Such farming will never return a profit; and if small cultivators working earnestly in their own interest can scarce make two ends meet, how can it be expected that a Government farm with hired laborers can extract a fair day's work all round? Until this is done financial success is impossible. The establishment of the farm has led to results which cannot be represented by cash statements, and it will, I feel confident, be admitted that our farm is worked with large profits.

8. Mr. Simpson's character is so well known to the Board that I need only say that he has conducted his duties during the past year to the entire satisfaction of the Cotton Commissioner and myself. I cannot speak too highly of his industry and devotion to his work.

3.—*From* J. SIMPSON, ESQ., *Superintendent, Model Farm, to* H. D. WILLOCK, ESQ., *Collector of Boolundshuhur.—Dated Boolundshuhur, the 12th July*, 1873.

I HAVE now the honor of submitting my supplementary report of the rubbee crops grown on the farm during the year 1872-73.

2. The total area sown with rubbee crops during the year under report was 93 acres 3 roods 5 poles, and of that 35 acres 2 roods 18 poles was sown with wheat of sorts, 25 acres 1 rood 7 poles with barley, 5 acres 2 roods with oats, 8 acres 2 roods 15 poles with peas, 9 acres 3 roods 10 poles with gram, 5 acres and 10 poles with bejhur (*i. e.*, gram and barley mixed), 1 acre 3 roods 15 poles with root crops, and 2 acres and 10 poles with tobacco, potatoes, &c.

Area sown with rubbee crops of sorts.

3. Of the total area under rubbee crops, 57 acres 2 roods 20 poles was deep-ploughed,—*i. e.*, ploughed once with an English plough and three times with the country plough. Of the remainder, 25 acres 3 roods 25 poles was ploughed five, and 10 acres 1 rood (the lands that were under indigo,) three times with the country plough; and all, except wheat which had been under indigo, were manured with village manure, at the rate of 85 maunds per acre. The plot of land which is used as an experimental garden received double the above quantity.

Preparation of lands.

4. The sowing of gram was commenced on the 20th September and was finished on the 6th October, the seed was all sown in the

Sowing of the crop.

native manner, "broadcast" (which is, I find, the safest to adopt with the implements at command), and lightly ploughed in, the surface being afterwards levelled with the harrows. The sowing of the other crops was not commenced until the 15th October, which is, I find, quite soon enough to sow any of the cereals, but from that date sowing was persevered with daily as the lands were got ready, the whole being finished on the 3rd November. The seed was all drilled in, in the native manner, which operation is performed by fixing a bamboo funnel to the country plough, into which the seeds are dropped by hand (a sower accompanying each plough for that purpose), and thus makes an efficient drill. The land having previously been well prepared, the seed was all got well into the ground, and (with the exception of 1½ acres of gram, which was damaged by rain falling the day after it was sown) all germinated capitally. And as water was generally obtained when required for irrigation, the progress of the crops throughout the season was mostly satisfactory.

Yield from the various crops under cultivation.

5. The wheat crop, which was a very close one, was nearly all irrigated three times. The largest yield obtained from one acre was 16 maunds 25 seers; that was the average obtained from 7 acres 3 roods 30 poles sown with red "unbearded" wheats in deep-ploughed lands, and the average yield of wheat of sorts from an area of 32 acres 2 roods 33 poles was 13 maunds 28 seers. The wheat on the farm was considerably above the average of the village crops on similar lands. Some of the fields would have compared favorably with the crops on highly-manured lands near the villages. The barley was about an average of the crops in the district, which have this season been mostly light, both in grain and straw. The largest yield of barley obtained from one acre was 16 maunds 6½ seers, that being the average yield obtained from an area of 9 acres 1 rood 35 poles of deep-ploughed lands; and the average yield from 10 acres and 10 poles ploughed in the native manner was 13 maunds per

acre. The oats were a fine even crop, but as scarcely any are grown in the district, no comparison can be made with the village crops. The average yield from 5 acres 2 roods was 17 maunds 30 seers. The peas were a fair crop, being rather above the average of the village crops. The largest yield of peas from one acre was 15 maunds 24½ seers, and was obtained from an area of 2 acres 2 roods 25 poles, ploughed in the native manner and irrigated. The average yield from 4 acres and 30 poles, "lands deep-ploughed" and grown without irrigation, was 15 maunds 6 seers. The gram on the deep-ploughed lands was a very fair crop, but that on land ploughed in the native manner was rather light, the yield both of grain and straw being considerably less from the latter. The average yield of gram from deep-ploughed lands was 16 maunds 13½ seers per acre, and the average yield from lands ploughed in the native manner was 14 maunds 4½ seers. The bejhur, or mixed crops, was not a heavy one, having been sown late after other crops. The average yield of gram per acre was 9 maunds 20½ seers. There was also a small plot, measuring some 27 poles, sown with English barley, the yield from which was 2 maunds 3 seers, or at the rate of 12 maunds 11 seers per acre. Any further particulars as to outturn of the above crops will be found in the annexed tables.

Root crops.

6. The first sowing of root crops was got in during the last week of September, and the soil then being nice and moist, nearly every seed germinated, and up to the 20th October all was in a very flourishing state; but unfortunately on that date an immense flight of locusts, which settled in the district and remained till the 23rd, entirely destroyed the young crops, which had till then been so promising. But with a little seed left from the first sowing and some left from the preceding year it was resolved to make a second sowing; but, owing to water not being obtained till late in November to irrigate the lands, little hopes were entertained of the second sowing being much of a crop. The following is a list of the crops sown, *viz.* :—

1. Messrs. Gibbs & Co.'s Purple top Swede.
2. Ditto Banghobee ditto.
3. Ditto Green top Yellow Hybrid Turnip.
4. Ditto White Globe Turnip.
5. Messrs. Sutton & Sons' Yellow Globe Mangel.
6. Ditto Champion Swede.
7. Ditto Yellow Tankard Turnip.
8. Ditto Purple top Mammoth Turnip.

Of the lands set apart for root crops, one acre was sown with seed of the first four varieties in equal parts, and the seed being all fresh, germinated very well, but owing to the late season at which they were sown, they never came to much. But it was easy to be seen that had the first sowing not been destroyed, a very fine crop would in all probability have been obtained, for the roots, considering the time at which they were sown, were of a fair size, were well shaped, and of excellent quality. The yield of roots from Nos. 1 and 2, as noted above, from one-fourth of an acre, was 23 and 22 maunds respectively, and the yield from Nos. 3 and 4, from a similar area, 20 and 18 maunds respectively. The seed of Nos. 5 to 8, being old, did not germinate well, and what did germinate never made any promising growth, and the yield was a mere nothing.

Tobacco, potatoes, &c.

7. Of the area set apart for sundry crops, one acre was planted with tobacco of sorts and 530 square yards with potatoes; the remaining area was taken up with fruit trees, hybrid cotton, &c. The tobacco seed beds were prepared and the seed sown on the 7th and 8th of November, and in lands well manured and prepared with the English and country ploughs, the young plants were planted out in the first week of February. The following are the varieties and area of each cultivated, *viz.*:—

1. Virginia Tobacco, 2,006 square yards.
2. Havannah ditto, 1,370 ditto.
3. Latakia ditto, 884 ditto.
4. Llandsdorf ditto, 580 ditto.

Seed of the Mexican, Guatemalia, and Manilla varieties were also sown, but the seed all failed to germinate; and a second sowing of the Manilla seed, which was that supplied by Government, also proved a failure.

The Virginia and Latakia varieties were a very fine crop: plants, being fine and strong, produced on an average from 12 to 14 fair-sized leaves. The Havannah and Llandsdorf varieties were scarcely so strong in growth as the above, but both produced a very fair crop; the leaves were of medium size, and averaged from ten to twelve per plant. The yield of marketable produce I am unable to furnish, for, owing to there being no empty store-room to cure the tobacco in, it was sold uncut.

The potatoes were planted on the 25th October in ridges 20 inches apart and about 10 inches apart in the row. The seed, although very small, came up pretty well, and although the growth of the plants was never very strong, they all looked nice and healthy up to the first week in January, when the tops were mostly all blighted by frost, and thus retarded the growth of the plants. The yield of tubers when taken up in the first week of March was 3 maunds 20 seers, or nearly 32 maunds per acre; the produce, like the seed, was very small, but of good quality.

The following fruit trees have been planted in the experimental garden, *viz.*, 10 mango trees "in orchard," 5 orange trees "grafted," 19 peach trees (7 "budded" and 12 "seedlings"), 24 guava trees, "seedlings," 4 loquat trees, "grafts," and 10 plantains.

8. In addition to tables before alluded to, Tables IV. and V. are also added; the former will show the farm expenditure for 1872-73, and the latter will show the amount realized by sale of produce and the value of produce in store, product of the farm in 1872-73. To this is also appended a report on the experiments made with Messrs. Crompton & Co.'s "Patent Animal Guano."

APPENDIX.

MESSRS. CROMPTON AND CO.'S PATENT ANIMAL GUANO.

4.—*From* J. SIMPSON, ESQ., *Superintendent, Model Farm, to* H. D. WILLOCK, ESQ., *Collector of Boolundshuhur.—Dated Boolundshuhur, the 5th July*, 1873.

I HAVE now the honour of submitting a report on the expements made with Messrs. Crompton & Co.'s "Patent Animal Guano," as requested by the Officiating Commissioner of Cotton and Commerce in his letter No. 2295, dated 10th October, 1872.

2. The "patent guano," as suggested in your docket No. 171, dated 12th October, 1872, was applied as a top-dressing to three plots of grain of the rubbee crop, *viz.*, one of barley and two of wheat, the detail and results of which will be found below.

Experiment No. 1 was made in a plot of barley, the area of which was exactly half an acre, and on one-half of the plot, *i. e.*, one-fourth of an acre, 84lbs of the guano was carefully spread on the 25th November, and on the same day the whole plot was irrigated; the field was again irrigated on the 30th January, that being as soon as water was required for the crop, which only had two waterings during the season. The guano, so far as I could discern, had not the least effect on the barley, neither in the color nor rankness of growth, and when the produce was weighed, the unmanured lands proved the most productive by a few seers. The following is the result;—

	Mds.	s.
Yield of grain from manured lands	3	33
Ditto straw ditto	4	0
Yield of grain from unmanured lands ...	4	0
Ditto straw ditto	4	10

Experiment No. 2 was made in a plot sown with *buddha* "or long-bearded" wheat. The area of the plot was 1 acre 25 poles, and on eight squares, measuring one-fourth of an acre, 84lbs. of the "patent guano" was carefully spread on the 27th November, and, like the first experiment, the whole

plot was irrigated the same day; the field was afterwards three times irrigated, *viz.*, on 2nd January, 12th February, and lastly on 2nd March. The crop on the manured plot for nearly a month after being top-dressed with the guano in no respect differed from the crops on the unmanured part of the field, but after that it became gradually darker in color and, if anything, stronger in growth, but neither in color nor growth was the difference very marked, and although the produce when weighed was rather in favor of the manured plot, the difference was not great. The following is the result:—

	Mds.	s.
Yield of grain from manured lands ...	2	37
Ditto straw ditto ...	4	33
Yield of grain from unmanured lands ...	2	32
Ditto straw ditto ...	4	20

Experiment No. 3 was made in a field sown with white "unbearded" wheat. The area of the plot was 1 acre 3 roods 15 poles, and to half an acre of it 168lbs. of the "guano" was applied on the 27th November as a top-dressing, and on the following morning the whole field was irrigated; it was again irrigated on the 13th January, and lastly on the 2nd March. In this field I could never discern the slightest difference between the crops that had received the top-dressing and what had not, and although the yield from the former was a little more, I think the difference should not be attributed to the guano. The following will show the results of the third and last experiment made:—

	Mds.	s.
Yield of grain from manured lands ...	8	22
Ditto straw ditto ...	12	29
Yield of grain from unmanured lands ...	8	10
Ditto straw ditto ...	12	20

I would also beg to state that the plots experimented on had not been irrigated previously, so that the guano mixed freely with the loose surface soil; very little of it was to be seen on the surface after it had been irrigated, and the soil of each plot was very equal in quality.

TABLE I.

Statement showing yield of Rubbee Crops from lands deep-ploughed and manured.

Description of crop.	Number of fields.	Area in acres.	Quantity of manure per acre, maunds.
1.	2.	3.	4.
Wheat, "red," unbearded ...	1,081 79	3 3 35 3 3 35	85
		7 3 30	
Wheat, "white," unbearded ...	1,080 1,318	2 1 30 1 3 15	85
		4 1 5	
Wheat, "red," bearded ...	1,315 67	2 2 30 3 3 10	85
		6 2 0	
Wheat, "white," bearded ...	74	4 3 0	85
Wheat, "long" bearded ...	1,317	1 0 25	85
Oats	1,336 1,340 1,341 72	3 0 10 0 3 25 0 3 15 0 2 30	85
		5 2 0	
Barley	1,343 1,355 1,354 1,342 63	2 2 5 2 1 30 0 1 25 0 2 0 3 2 15	85
		9 1 35	
Peas, round, white	1,326	4 0 30	85
Gram	53 68 76	3 0 25 3 1 30 1 2 35	85
		8 1 10	

TA

Statement showing yield of Rubbee Crops from

Description of crop.	Quantity of seed sown per acre, lbs.	Date of sowing.	Date of reaping.	Total yield of grain and straw in lbs.
1.	5.	6.	7.	8.
Wheat, "red," unbearded,	126	26th October, 27th ditto ...	7th April ... 2nd ditto ...	24,942
Wheat, "white," unbearded.	126	26th October, 24th ditto ...	9th April ... 17th ditto ...	14,318
Wheat, "red," bearded ...	136	25th October, 27th ditto ...	10th April ... 12th ditto ...	18,240
Wheat, "white," bearded,	124	31st October.	14th April ...	9,296
Wheat, "long" bearded ...	96	25th October,	18th April ...	2,744
Oats	87	3rd Novr. ... Ditto ... Ditto ... 4th ditto ...	31st March... 2nd April ... Ditto ... 5th ditto ...	16,962
Barley	95	15th October, 19th ditto ... Ditto ... Ditto ... 1st Novr. ...	18th March... 19th ditto ... Ditto ... Ditto ... 28th ditto ...	25,522
Peas, round, white ...	60	17th October,	14th March...	10,920
Gram	54	6th October, 28th Sept. ... 26th ditto ...	1st April ... Ditto ... 3rd ditto ...	26,072

BLE I.

lands deep-ploughed and manured.—[concluded.]

Total yield of grain in lbs.	Average yield of grain per acre in lbs.	Total yield of straw in lbs.	Average yield of straw per acre in lbs.	Proportion of grain to straw.	Remarks.
9.	10.	11.	12.	13.	14.
				Per cent.	
10,560	1,330·30	14,382	1,811·90	42·33	Irrigated three times.
5,678	1,311·64	8,610	2,018·10	39·65	Ditto ditto.
7,840	1,206·15	10,400	1,600	42·98	Ditto ditto.
4,172	878·31	5,124	1,078·73	44·87	All irrigated twice, and a part three times.
1,048	906·37	1,696	1,466·81	38·19	Irrigated four times.
7,816	1,421	9,146	1,162·90	46·	Irrigated twice.
12,252	1,293·94	13,270	1,401·45	48·	Ditto ditto.
5,080	1,212·83	5,840	1,379·70	46·51	Grown without irrigation.
10,872	1,307·96	15,200	1,828·57	41·69	Ditto ditto.

T A

Statement showing yield of Rubbee Crops from lands

Description of crops.	Number of fields.	Area in acres.	Quantity of manure in maunds.	Quantity of seed sown per acre, lbs.	Date of sowing.
1.	2.	3.	4.	5.	6.
Wheat, "white," bearded ...	70	6 2 20	85	124	29th October
Barley	1,316	3 2 5	...	...	18th October,
	1,328				19th ditto...
	1,353	1 2 25	85	95	...
	1,351	2 0 30	...	...	19th October,
	1,352				
	60	2 2 30	...	...	1st Novemb. r
		10 0 10			
Peas, "round," white ...	1,344	2 2 25	85	60	16th October
Gram	1,334	1 2 0	85	54	20th Septr....
Bejhur, *i. e.*, gram and barley	1,334	1 2 0	85	100	18th Novr. ...
	86	2 1 30			21st ditto ...
	64	1 0 20			31st ditto ...
		5 0 10			
		25 3 25			

BLE II.

ploughed with the country plough and manured.

Date of reaping.	Total yield of grain and straw in lbs.	Total yield of grain in lbs.	Average yield of grain per acre in lbs.	Total yield of straw in lbs.	Average yield of straw per acre in lbs.	Proportion of grain to straw.	Remarks.
7.	8.	9.	10.	11.	12.	13.	14.
						p. c.	
13th April ...	14,176	5,682	857·66	8,494	1,289·97	40·	Nearly all three times irrigated.
22nd March 23rd ditto... 18th ditto... 24th ditto... 27th ditto...	22,940	10,468	1,040·23	12,472	1,239·45	45·58	Twice irrigated.
24th March..	6,840	3,320	1,249·88	3,520	1,322·82	48·53	Irrigated once.
29th March...	3,892	1,694	1,129·2	2,198	1,465·2	43·52	A little damaged at sowing time by rain; grown without irrigation.
5th April ... 15th ditto .. 28th March,	7,748	3,856	761·55	3,892	768·79	49·76	Sown late; irrigated twice.

TABLE III.

Statement showing yield of Rubbee Crops from lands ploughed in the native manner "after Indigo."

Description of crops.	Number of field.	Area in acres.	Quantity of seed sown per acre, lbs.	Date of sowing.	Date of reaping.	Total yield of grain and straw in lbs.	Total yield of grain in lbs.	Average yield of grain per acre in lbs.	Total yield of straw in lbs.	Average yield of straw per acre in lbs.	Proportion of grain to straw.	Remarks.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
											Per cent.	
Wheat, "red," bearded.	1,323 1,324	1 0 25 1 3 0 2 3 25	136	24th October, 2nd Novr. ...	17th April ... Ditto ...	4,866	2,248	773·52	2,618	879·31	46·19	Sown after indigo; irrigated three times.
Barley ...	1,290 1,154	3 0 25 2 1 30 5 2 15	95	18th October, 23rd ditto...	22nd March,... 26th ditto...	7,346	3,680	657·98	3,666	655·37	50·	Sown after indigo; irrigated twice.
Peas ...	1,335	1 3 0 10 1 0	60	23rd October,	26th March...	2,872	1,208	690·28	1,664	950 85	42·	Sown after indigo; irrigated once.

TABLE IV.

Tabulated Form of the Expenditure of the Boolundshuhur Cotton Farm for the year ending 31st March, 1873.

Months.	Clearing.	Loading and spreading manure.	Ploughing.	Sowing	Weeding.	Thinning and topping cotton.	Irrigating.	Picking.	Cleaning.	Reaping.	Threshing.	Storing.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
April, 1872 ...	...	10 6 0	4 0 0	...	4 14 0	...	2 6 0	5 13 6	20 12 0	47 2 6	138 14 3	29 12 0
May „ ...	2 8 0	7 6 0	101 0 0	0 10 0	1 15 0	...	14 14 0	0 8 0	14 11 0	...	8 10 0	3 9 0
June „ ...	10 12 0	0 5 0	12 6 0	16 2 0	...	...	7 0 0	...	0 4 0	...	0 2 0	1 6 0
July „ ...	3 14 0	1 11 0	4 8 0	7 7 0	102 6 0	8 7 0	...	...	0 9 0	...	...	...
August „ ...	...	2 13 0	7 0 0	...	134 8 0	3 8 0	...	...	...	...	...	...
September „ ...	3 2 0	2 1 0	228 6 0	0 10 0	41 7 0	...	...	5 14 6	0 12 0	2 7 0	0 4 0	...
October „ ...	...	...	15 8 0	29 11 6	...	...	4 3 0	63 12 0	7 10 0	1 12 0	0 10 0	...
November „ ...	...	...	...	3 13 0	...	...	11 2 0	66 3 0	23 14 0	5 10 3	...	0 6 0
December „ ...	2 7 0	4 6 0	...	0 2 0	...	...	7 8 0	35 5 6	38 6 3	0 4 0	...	1 4 0
January, 1873 ...	10 3 0	12 15 0	...	...	0 12 0	...	8 7 0	21 3 9	23 9 1	...	...	...
February „ ...	0 14 0	0 14 0	...	...	1 5 0	...	6 4 0	0 6 0	...	...	...	...
March „ ...	2 0 0	3 10 3	3 0 0	...	9 8 6	...	5 6 0	...	1 3 6	37 5 0	53 0 9	9 11 0
Total Rs. ...	35 12 0	46 7 3	375 12 0	68 7 6	296 11 6	11 15 0	67 2 0	199 2 3	131 10 10	94 8 9	201 9 0	46 0 0

TABLE IV.

Tabulated Form of the Expenditure of the Boolundshuhur Cotton Farm for the year ending 31st March, 1873 —[continued].

Months.	Sundry works.	Manure.	Cartage of manure.	Implements.	Seeds and plants.	Carriage of implements, &c.	Tools, new and repaired.	Bags.	Rent of lands.	Water-rent.	Buildings.
	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p	Rs. a. p.	Rs. a. p.	Rs. a p	Rs. a. p.	Rs. a. p.	Rs. a. p.
April, 1872 ...	5 10 0	...	133 8 0	...	...	...	3 0 0	6 0 0	...	...	27 5 0
May ,, ...	13 3 0	481 0 0	22 8 0	...	...	3 6 0	...	...	...	246 10 8	5 11 3
June ,, ...	10 10 0	...	4 0 0	...	25 0 0	2 12 0	10 7 6	...	...	...	...
July ,, ...	3 15 0	20 2 6	...	...	7 8 6	...	1 2 0	...	...	...	...
August ,, ...	8 6 0	19 0 0	...	57 14 0	211 4 7	5 1 0	2 9 6	3 12 6	...	156 12 0	...
September ,, ...	11 7 0	...	4 0 0	73 8 0	7 6 3	7 1 6	2 15 6	...	46 4 6	...	...
October ,, ...	16 9 0	...	1 0 0	...	7 10 6	2 14 0	0 8 6	...	...	...	...
November ,, ...	8 11 0	...	...	...	14 4 3	8 13 6	20 8 9	12 0 0	...	...	...
December ,, ...	3 3 0	...	24 0 0	65 0 0	...	0 1 0	4 7 6	...	...	...	...
January, 1873 ...	2 6 0	...	121 0 0	...	52 8 0	...	7 1 0	...	1,225 5 5	...	...
February ,, ...	17 5 0	...	...	...	...	...	1 8 6	...	...	...	...
March ,, ...	7 9 0	...	43 0 0	...	38 13 0	...	3 3 0	...	...	231 8 4	...
Total Rs. ...	108 14 0	520 2 6	353 0 0	196 6 0	364 7 1	30 1 0	57 7 9	21 12 6	1,271 9 11	634 15 0	33 0 3

TABLE IV.

Tabulated Form of the Expenditure of the Boolundshuhur Cotton Farm for the year ending 31st March, 1873 —[concluded].

Months.	Roads.	Wells.	Stock, cattle and sheep.	Feed of cattle and rams.	Salary of Mohurrir in Sudder Office.	Travelling expenses of Superintendent.	*Cost of establishment.	Books for Farm Library.	Sundries.	Monthly Totals.	Grand Total.
	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
April, 1872 ...	...	...	...	16 12 3	5 0 0	15 0 0	46 1 0	...	8 4 3	530 8 9	
May ,, ...	...	...	...	51 4 0	5 0 0	...	48 12 0	...	10 7 3	1,053 9 2	
June ,, ...	...	...	...	40 7 0	5 0 0	...	43 0 0	42 1 0	3 11 6	235 6 0	
July ,, ...	...	...	...	134 3 5	5 0 0	...	6 9 9	...	5 14 0	343 5 2	
August ,, ...	...	...	50 0 0	38 12 0	5 0 0	6 8 0	53 6 8	...	2 1 0	768 4 3	
September ,, ...	...	...	...	30 5 10	5 0 0	...	71 2 4	...	7 12 3	551 14 8	
October ,, ...	...	...	...	42 4 0	5 0 0	...	48 8 0	...	4 2 6	251 11 0	
November ,, ...	...	...	...	30 13 9	5 0 0	1 0 0	36 11 0	...	5 14 6	254 13 0	
December ,, ...	...	...	8 12 0	5 4 0	5 0 0	...	43 8 0	30 0 0	25 13 3	304 11 6	
January, 1873 ...	...	202 5 0	51 14 0	75 7 0	5 0 0	...	56 0 0	...	3 14 3	1,879 14 6	
February ,, ...	10 0 0	...	...	28 10 9	5 0 0	...	49 7 6	...	3 10 9	125 5 6	
March ,, ...	...	...	...	182 12 10	5 0 0	...	50 3 0	...	3 12 0	691 4 2	
Total Rs. ...	10 0 0	202 5 0	110 10 0	677 0 10	60 0 0	22 8 0	583 15 3	72 1 0	85 5 6	6,990 11 8	6,990 11 8

*Note.—The sums entered under this heading includes pay of clerk, chupprassies, and ploughmen employed permanently.

TABLE V.

Statement showing value of Farm Produce for the year 1872-73.

Description of produce.	Value of produce sold.	* Value of produce in store.	Total amount.	Grand Total.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1 Indigo ...	360 0 0	...	360 0 0	
2 Sugar-cane ...	174 10 0	...	174 10 0	
3 Maize "grain" ...	21 7 2	...	21 7 2	
4 Ditto "kurbee"...	4 0 0	...	4 0 0	
5 Jowar "grain" ...	...	11 0 0	11 0 0	
6 Ditto "kurbee" ...	136 6 6	...	136 6 6	
7 Cotton ...	759 2 6	..	759 2 6	
8 Ditto "seed" ...	214 11 9	...	214 11 9	
9 Ditto "trees" ...	20 0 0	...	20 0 0	
10 Wheat "grain" ...	148 9 9	804 11 9	953 5 6	
11 Barley ditto ...	3 4 0	486 6 6	489 10 6	
12 Oats ditto ...	103 14 0	14 8 2	118 6 2	
13 Peas ditto ...	0 8 0	171 14 6	172 6 6	
14 Gram ditto ...	14 15 0	233 6 4	248 5 4	
15 Bejhur ditto ...	18 11 9	50 12 3	69 8 0	
16 Urhur ditto ...	10 2 0	...	10 2 0	
17 Straw of sorts ...	...	372 0 0	372 0 0	
18 Turnips ...	15 0 0	...	15 0 0	
19 Potatoes ...	5 0 0	...	5 0 0	
20 Tobacco ...	30 0 0	...	30 0 0	
21 Wool ...	6 0 0	...	6 0 0	
22 Manure ...	17 8 0	...	17 8 0	
Total Rs. ...	2,063 14 5	2,146 7 6	4,210 5 11	4,210 5 11

* The produce in store is valued at bazaar rates.

5.—*From* C. A. ELLIOTT, ESQ., *Secretary to Government, North-Western Provinces, to* E. C. BUCK, ESQ., *Officiating Secretary to the Board of Revenue*, (*No.* 319).—*Dated Allahabad, the 7th November*, 1873.

I AM directed to forward, for the information of the Board, a copy of the report on the Boolundshuhur Model Farm for the rubbee harvest of 1872-73, and to communicate the following remarks and orders thereon.

2. The report should have been submitted by the Commissioner to the Board, and forwarded by them to Government along with the reports of the Cawnpore and Allahabad Model Farms. But to save time it has not been returned to the Board on this occasion.

3. As to the area of the Farm itself nothing is clearly stated. In 1871-72 it was reported to be 182 acres 1 rood 35 poles. During the year 1872-73 an additional plot of 12 acres 1 rood 25 poles seems to have been added, as Mr. Willock, in his letter of 21st April, 1873, reports the total area to be 194 acres 3 roods 20 poles. This should not have been done without special sanction from Government, and it should be explained why there is nc entry for compensation on account of the land thus taken up in the accounts of the year. Of this the area under cotton cultivation was 87 acres 2 roods, leaving 107 acres 1 rood 20 poles for other crops, which was apparently thus divided :—

	A.	*R.*	*P.*
For khurreef crops	24	1	30
„ rubbee „	82	3	30

A plot of 10 acres 1 rood, which was sown with indigo, was re-cultivated with wheat, barley and peas, making the total area under rubbee 92 acres 4 roods 30 poles. But this area does not agree with that given in paragraph 2 of Mr. Simpson's report, where it is stated to be 93 acres 3 roods 5 poles. This should be explained.

4. Again, of the total area under rubbee cultivation, *viz.*, 93 acres 3 roods 5 poles, the figures on the margin show the distribution of the different crops. These figures are taken from Mr. Simpson's report, paragraph 2, but in respect of wheat and barley they do not

	A.	*R.*	*P.*
Wheat	35	2	18
Barely	25	1	7
Oats	5	2	0
Peas	8	2	15
Gram	9	3	10
Bejhur	5	0	10
Root crops	1	3	15
Tobacco, &c.... ...	2	0	10
	93	3	5

agree with those shown in the statements attached to the report, which are as follows:—

	A.	*R.*	*P.*
Wheat	34	0	25
Barley	25	0	20

and which alter the total area to 92 acres 0 roods 25 poles. These discrepancies also require to be cleared up.

5. A short mention is made of the khurreef crops in the report submitted by the Superintendent of the Farm on the 26th February, 1873. They consisted chiefly of indigo, maize, jowar, *Sorghum saccharatum*, and sugar-cane. The maize crop suffered from heavy rain, while the jowar and sorghum were damaged by excessive moisture, and seriously affected by a flight of locusts which settled on the land from the 20th to the 23rd October. The statement (No. VII.) appended to the report gives the produce only of 10 acres 2 roods 10 poles under these crops, and omits all mention of the rest.

6. Of the total area under rubbee cultivation, 57 acres 2 roods and 10 poles were ploughed once with the English plough and three times with the native plough, the remainder being ploughed in the native fashion, part of it five times, and the 10 acres which had been under indigo three times.

7. The following statement shows the average yield per acre of the different crops as compared with the previous year:—A. on deep-ploughed and manured land, B. on land ploughed in the native fashion and manured, and C. on land sown with indigo and afterwards re-cultivated with wheat, barley, and peas:—

		Land under cultivation.		*Average yield per acre.*				Times irrigated.		Quantity of manure per acre in maunds.	
				Grain.		Straw.					
		1871-72.	1872-73.	1871-72.	1872-73.	1871-72.	1872-73.	1871-72.	1872-73.	1871-72.	1872-73.
		A. R. P.	A. R. P.	M. S.	M. S.	M. S.	M. S.			M. S.	M. S.
Wheat of kinds ...	A.	19 2 25	24 2 20	10 37	14 3	17 0	17 37	1 and 2	2 to 4	103 6	85 0
	B.	24 2 20	6 2 20	12 14	10 28	21 17	16 5	Ditto	3 times	103 6	85 0
	C.	...	2 3 25	...	9 27	...	11 0	...	Ditto	...	...
Barley ...	A.	...	9 1 35	...	16 7	...	17 20	...	Twice	...	85 0
	B.	14 0 0	10 0 10	20 16	13 0	19 10	15 19	1 and 2	Ditto	103 6	85 0
	C.	...	5 2 15	...	8 9	...	8 7	...	Ditto	...	...
Peas ...	A.	1 2 35	4 0 30	20 22	15 6	30 30	17 9	Once	None	103 6	85 0
	B.	4 1 10	2 2 25	24 29	15 24	29 3	16 21	None	Once	103 6	85 0
	C.	...	1 3 0	...	8 25	...	11 35	...	Ditto	...	...
Gram ...	A.	2 3 15	8 1 10	24 16	16 13	36 37	22 34	None	None	103 6	85 0
	B.	2 0 5	1 2 0	20 32	14 4½	26 2	18 12	Ditto	Ditto	103 6	85 0
Oats ...	A.	...	5 2 0	...	17 30	...	14 21	...	Twice	...	85 0
	B.	not given	...	25 18	...	38 23	...	Twice	...	103 6	...

Comparing the yield from the two classes of land A. and B, the crops sown on deep-ploughed land show better results than on the other, except in the case of peas, where the yield is slightly less ; but any comparison of the outturn must be partly vitiated by the different conditions under which the crops were cultivated during the two years, both as regards the number of times which they were irrigated, the quantity of manure which was applied, and the area under cultivation. The average outturn does not generally compare favorably with the results of last year ; and it is said that, owing to the failure of the winter rains, the harvest was an unusually light one.

8. The details of different kinds of wheat (red and white, bearded and unbearded) were not given in the previous year, and the figures of this year cannot be subjected to comparison. The kind called long bearded is apparently the same as the "pedigree or long bearded" wheat of last year. If so, the progress of this experiment of selecting seed deserved a fuller notice.

9. The amount of manure given in each case was the same, or 85 maunds per acre. It would probably be well to vary it, using more in some lands and less in others, and to watch the effects of the experiment. Eighty-five maunds, or about 3 tons, is not much for an acre of land.

10. The expenditure of the year was Rs. 6,990-11-8, against Rs. 8,221-12-10 in 1871-72. The payment on account of rent of land has decreased considerably, from Rs. 2,160-0-1 to Rs. 1,271-9-11. The reason for this falling off should be explained, for it is the more remarkable because of the increase in the area noticed in my 4th paragraph. The variations in other items of expenditure, such as the increased cost of threshing and of water-rent, the decreased cost of carting manure, should have been noticed. Against the total expenditure must be set—

			Rs.	a.	p.
1.	Value of produce sold	...	2,063	14	5
2.	Ditto in store	...	2,146	7	6
	Total Rs.	...	4,210	5	11

which leaves a net expenditure of Rs. 2,780-5-9. But the amount of produce in store is not stated, nor the rate at which its value is calculated.

11. Three experiments were made with Messrs. Crompton and Co.'s "patent animal guano" manure; the results as reported by the gardener were not valuable, and do not tend to show that any great benefit, if any at all, can be derived from the use of the manure.

12. For future reports of these Model Farms, His Honor considers it desirable that a uniform system should be adopted. A special report on cotton cultivation should be drawn up as now and submitted as soon after the crop is picked as possible. The Annual Report of the Farm should be for the operations of the whole year, khurreef as well as rubbee (including a brief review of the cotton results), and should contain a uniform set of returns and tables, so that the results of each Farm may easily be compared with one another and with the preceding year. The entire area under each crop should be given, the method of cultivation, the quantity of produce, and the amount sold, with the prizes obtained, the amount remaining in store at the close of the year, and generally such further particulars as may be of interest. The reports should be accompanied by a certificate by the Treasury Officer as to the correctness of the accounts, and should be submitted by the 1st July to the Commissioner, who should forward them to the Board, for submission to Government.

13. I am to request that the Board will prepare a set of statements showing all the necessary particulars for the purpose

of future reports, and will draw up some brief instructions regarding the reports. These should be submitted for the approval of Government.

14. I am to add that the thanks of Government are due to the Collector, Mr. Willock, for the great interest and pains which he takes in the Farm, and also to Mr. Simpson, the Superintendent. His Honor would again repeat that the object to be kept in view is the improvement of indigenous cultivation by processes not too difficult or expensive for the native cultivator; and also the improvement of seed by careful selection, rather than the introduction of new plants or exotics. There is reason to apprehend that the Boolundshuhur Farm has not yet fulfilled either of these objects in a sensible degree; and Mr. Willock's earnest endeavours should be directed to the double object above laid down.

Art. XXXIV.

SPECIAL EDUCATION OF MAHOMEDANS.

1.—*From* M. KEMPSON, ESQ., *Director of Public Instruction, to* C. A. ELLIOTT, ESQ., *Secretary to Government, North-Western Provinces* (*No.* 534*G.*).—*Dated Nynee Tal, the* 18*th August*, 1873.

I HAVE the honor to submit, for the Hon'ble the Lieutenant-Governor's consideration, a paper on Mahomedan education, with suggestions for the institution of an improved course of Oriental studies. The subject has engaged attention of late years, and though nothing new may have been said now, I shall at least have given reasonable grounds for hopefulness, and have gone further than others in some respects in the way of practical suggestions.

2. The gist of what is said is—

(1.) The question of Mahomedan education may be treated apart from religious and political considerations, because the causes of the moral and mental torpor of Islam in this country are not really explicable by either.

(2.) The curative treatment consists—

(*a.*)—In renovating the curriculum of indigenous secondary education among the Mahomedans, by the aid of a general examination, centrically conducted, in vernacular and Orientals.

(*b.*)—In elevating and improving the curriculum of Tehseelee Schools in Mahomedan districts.

(*c.*)—In adding to the popularity of Sudder Station or Zillah Schools in the large Mahomedan towns by opening Oriental Departments.

(*d.*)—In prescribing a course of study for matriculation in the Vernacular Oriental Department of the Central College. This course is most important in determining the school curriculum below and the collegiate curriculum above.

3. The points (*c*) and (*d*) press for immediate attention, and the cost of the Oriental Departments is estimated for provision, if His Honor approves, in the Budget of 1874-75. As regards the courses of study, I have submitted a sketch of the proposed matriculation and collegiate curricula, setting beside them in each case the present standards of the Calcutta University for comparison. Lists of authors and books in Persian and Arabic are added, and I am anxious to have the means of augmenting and improving these by obtaining, through the Government, lists and copies of the educational works used in Persia, Syria, and Algeria. Both the schemes of study and the lists of books might, I think, be usefully subjected to discussion by some of the Educational Committees or leading Mahomedan Societies, and by individuals.

ORIENTAL MATRICULATION EXAMINATION.	ENTRANCE EXAMINATION, CALCUTTA UNIVERSITY.
I.—Language.	*I.—Language.*
(*a.*) Persian, or (*a.*) Arabic. (The subjects to be taken from the list of authors accompanying.)	(*a.*) English, (*b.*) Persian, or } Easy Selections (*b.*) Arabic } and Grammar.
II.—History and Geography.	*II.—History and Geography* (in English).
(*a.*) History of England (Urdoo). History of India (Urdoo). (*b.*) A Persian Historian, or (*b.*) An Arabic Historian. (*c.*) Outlines of General Geography (Urdoo). Geography of India (Urdoo).	(*a*) History of England. History of India. (*b*) Outlines of General Geography. Geography of India.

III.—Mathematics (Urdoo).

Arithmetic.
Algebra up to Simple Equations.
Euclid, Books I to IV.
Plane Surface Mensuration.

Or, III.— Logic (Urdoo).

Mobádi-ul-Hikmat.

IV.—Morals.

Akhláq i-Káshí (Urdoo).
Akhláq-i-Muhsini (Persian), or Kimia Saadat (Arabic).

Or, IV.—Physics (Urdoo).

Elements of Physical Science.
Physical Geography.

III.—Mathematics (in English).

Arithmetic.
Algebra to L. C. M.
Euclid, Books I. to IV.

ORIENTAL MIDDLE EXAMINATION.

I.—Language.

(*a.*) Persian, or
(*a*) Arabic.
(The subjects to be taken from the list of authors accompanying.)

II.—History,

(*a.*) Ancient History (Urdoo).
(*b.*) A Persian Historian, or
(*b.*) An Arabian Historian.

III.—Mathematics (Urdoo).

Arithmetic.
Algebra to Logarithms.
Euclid, Books VI. and XI., to prop. 21.
Plane Trigonometry.
Elementary Statics.
Geometrical Conics.

Or, III.—Logic and Rhetoric.

(*a*) { Qutbi, Mír Qutbi.
{ Mulla Hasan.
(*b.*) { Mukhtasar Mani.
{ Mutavval.

IV.—Morals.

(*a.*) Persian— { Akhláq-i-nasiri.
{ Akhláq jalali, or

F. A. EXAMINATION, CALCUTTA UNIVERSITY.

I.—Language,

(*a.*) English.
(*b.*) Persian, or
(*b.*) Arabic.
(Text-books, Zuhuri, Bedil, Urfi, &c, and Selections.)

II.—History (in English).

Ancient History (Taylor).

III.—Mathematics (in English).

Arithmetic.
Algebra to Logarithms.
Euclid, Books VI. and XI., to prop. 21.
Plane Trigonometry.
Elementary Statics.

IV.—Logic (English Treatise).

V.—Psychology (Reid or Abercrombie.)

(*b.*) Arabic .. { Ahyá-ul-ulum. Mabrezi.

Or, IV.—Physics.

Organic Chemistry.
Animal Physiology.

Or V.—Physics.

Chemistry of the Metalloids.

ORIENTAL FINAL EXAMINATION.

I.—Language.

(*a*) Persian, or
(*a.*) Arabic.
(The subjects to be chosen from the list.)

II.—Mixed Mathematics (Urdoo).

Dynamics, Hydrostatics, Optics, Astronomy.

III.—(1.) *Political Economy* (Urdoo.)

(2.) *Modern History* (Urdoo).

Or, III.—Physics (Urdoo).

(*a.*) Inorganic Chemistry.
(*b.*) Acoustics, Thermotics, Optics, Magnetism, Electricity (taught in an elementary manner), or
(*b.*) Physiology, Animal, Vegetable, and General, or
(*b.*) Geology and Mineralogy.

B. A. EXAMINATION, CALCUTTA UNIVERSITY.

A. *I.—Language.*

(*a.*) English.
(*b.*) Persian, or
(*b.*) Arabic.

II.—Mixed Mathematics (in English).

Mechanics, Hydrostatics, Hydraulics, Pneumatics, Astronomy.

III. and IV.

Two of the following subjects marked (*a.*), (*b.*), and (*c.*), *viz.* :—

(*a.*) 1.—Mental Philosophy (Hamilton).
2.—Moral Philosophy (Fleming), or Natural Religion, or Logic (inductive).
(*b.*) 1.—History of England (Hume).
2.—History of India (to 1835).
3.—Arnold's Lectures, or Mill on Representative Government, or History of the Jews.
(*c.*) Pure Mathematics, Additional Course.

B. (Alternative.)

I.—English.
II.—Mixed Mathematics, as in A.
III.—Inorganic Chemistry.
IV.—1. Physical Geography.
2. One of four groups of Physical Science subjects (C.U. Calendar 1873-74, p. 41.)

ARABIC LITERATURE.

Literature and History.

Hikáyát Nafhat-ul-yemen.	Saba Muallaqa.
Ikhwán-us-Safa.	Taríkh Talit.
Mákámát Harírí.	Taríkh Timúri.
Himasa.	Taríkh Yameni (Utbi).
Mutanabbí.	Mayár-ul-ashár (Tusi) Prosody.

Logic.

Isaghoji.	Hamd Ullah.
Bádí-ul-mizan.	Mír Zàhid
Tahzíb, Sharah Tabzíb.	Háshiya Bahr-ul-ulum.
Qutbi.	Sharh Mutáli.
Mír Quthí.	Qázi Mubárak.
Mulla Hasan.	Afq-ul-Mobin.

Rhetoric.

Mukhtasur Máni.	Mutavval.

Morals.

Kimia Saádat.	Mabázi.
Ahya-ul-ulum.	

LIST OF PERSIAN AUTHORS.

Literature and Poetry.

Sadi	...	Gulistan, Bostan.
Anon	...	Chahár Durvesh
„	...	Chahár Gulzár,
„	...	Ruqaát Alamgíri.
„	...	Ruqaát Mirza Bedil.
Husain Váiz	...	Anvar-i-Suheli.
Abul Fazl	...	Daftar.
Jámi	...	Beháristan Tufátul Abrár.
„	...	Salámán-o-Absál.
Firdúsi	...	Shah Náma.
Nizámi	...	Khamsah.
„	...	Makhzan-ul-Asrar.
Attár	...	Pund Náma.
Hafiz	...	Diwan.
Sanai	...	Diwan.
Ansari	...	Selected portions.
Kháqáni	...	
Badr Chach	...	
Zuhúri	...	
Umur Qiyám	...	
Urfi	...	
Niamat Khan Ali	...	

Morals.

Nasir-ud-din Tusi	...	Akhláq-i-Násiri.
Jalal-ud-din	...	Akhláq-i-Jaláli.
Husain Vaiz	...	Akhláq-i-Muhsini.

History.

Mír Khond	...	Rouzat-us-Safa.
Wassaf	...	Persian History.
Ferishta	...	History of India.
Bábar	...	Memoirs.
Mínhaj-us-Siráj	...	Tabaqát-i-Násiri.
Hasan Nizám	...	Taj-ul-Maásín.
Zia-ud-din Barní	...	Taríkh Feroz Shahí.
Abdul Kadir Budaoni	...	Indian History.
Nizam-ud-din Ahmud	...	
Mutimad Khan	...	Jahangir Náma.
Mahomed Bin Salah	...	Shah Jahan Náma.
Mahomed Kasim	...	Alamgir Náma.
Khafi Khan and Golam Husain Khan.		

2.—*From* C. A. ELLIOTT, ESQ., *Secretary to Government, North-Western Provinces, to* M. KEMPSON, ESQ., *Director of Public Instruction (No.* 40*).—Dated Allahabad, the* 14*th November*, 1873.

I AM directed to acknowledge the receipt of your letter No. 534G., dated the 18th August, 1873, and enclosures, on the subject of special education of Mahomedans.

2. In reply, I am to say that the Hon'ble the Lieutenant-Governor thanks you cordially for having so carefully and comprehensively discussed this important subject.

3. The decadence of Mahomedan scholarship in India, and the disinclination of the Mahomedans, as a body, to fall in with our University system, and the appropriate remedy for these evils, are matters of the highest importance, both socially and politically. Socially, because it is a duty incumbent on the British Government so to shape its educational measures as to make them agreeable to this large section of the people, who at present, by their predilections, or it may be prejudices, are shut out from the influence of our educational system. Politically, because the enlightenment of the Mussulmans, and the gaining of them over to co-operate with ourselves in the education of their youth, would prove one of the surest means of attaching them to our rule. But for this purpose, it is essential that the teaching of modern science be

combined with that of their own literature, and thus made acceptable, and we may trust in the end even popular, amongst them.

4. The measures proposed by you seem to His Honor in every way well calculated to secure the great object in view; and there are not wanting signs that they will gradually make their way among the Mahomedan population. Among these may be mentioned the Mahomedan endowment at Jounpore, maintained by Moulvie Hyder Hossein, into which the enlightened incumbent has introduced the teaching of English and European science, as auxiliary to the standard curriculum. The Chushmai-Ruhmat also, in Ghazeepore, a private and indigenous institution, has followed the same course, and, as such, receives a grant-in-aid from Government. Among the indigenous schools assembled for His Honor's inspection at various important centres, a readiness was very generally expressed by the managers and teachers to accept our school books in addition to their own course, and to receive the countenance and aid of Government.

5. While, therefore, the University course is, from its essentially European character, repellent to the Mahomedans as a body, there is every encouragement to hope that a mixed system, which shall recognize the primary advantages of an Oriental training in the literature to which they are naturally wedded by all the associations of their birth and their faith, and shall at the same time introduce the elements of a liberal training in modern knowledge and science, may gradually find its way among the Mussulman people of India, and tend to their amelioration and enlightenment, to elevate them socially; and (as we may also hope) draw them into closer association with the ruling power.

6. The means proposed approve themselves fully to the judgment of the Lieutenant-Governor. The establishment of an Oriental branch in the zillah schools is the first and most important project; and the proposals for this end are approved,

and the necessary provision may be made in the Educational Budget for the year 1874-75. Preparations for the introduction of the new staff of teachers may, indeed, be made at once gradually and as opportunity offers; and in such case extra provision will be admitted for such funds as may be found necessary in the present year.

7. *Second.*—The constitution of a Board of Examiners at the Central College for Vernacular and Oriental schools has already been effected; and the experiment made last year shows that it will work successfully. The establishment of an Arabic chair has just been sanctioned, and will complete the Oriental staff for that purpose.

8. *Third.*—The scheme of studies proposed by you appears every way suitable, and is accordingly approved. Experience will gradually show in what way it may be improved and systematized. The great difficulty as regards European science, history, &c., is the want of text-books in the vernacular; but we may hope that these will gradually be supplied; and the Prize Notification, if continued (as His Honor trusts it will), may help to supply the want.

9. Sir William Muir highly commends the proposal to procure specimens of the books in use in the Educational Institutions in Mahomedan countries. Endeavours have already been made, but hitherto with little success, to obtain through the India Office copies of works published in Egypt and the Mediterranean littoral. Perhaps it may be better to open communications direct with the Consuls in Egypt, Turkey, Persia, Syria, and Algeria, and greater success might be attained by this means. His Honor desires that you will communicate your views on this subject to Government.

10. The question of conferring some title on those who successively pass the higher standards in the vernacular may be kept in view. If the degree of Moulvie be conferred on the Mahomedan scholar, that of Pundit should equally be

given to the Hindoo who acquires proficiency in Sanskrit, with a knowledge of modern science, &c., as contemplated by you in the Mahomedan course.

11. Lastly, there is the encouragement proposed to be given to the indigenous schools. This question has already been discussed in the orders of Government about to issue on your annual report, to which I am desired to refer you. His Honor readily consents to the entry of Rs. 1,000 for each circle as a fund for prizes, money rewards, &c., to stimulate the better classes of indigenous schools, as well as to evince the interest of Government in their improvement.

12. In conclusion, I am to say that you have performed a good work in submitting this subject in so large and practical a manner; and the Lieutenant-Governor trusts that your proposals will lay the foundation of what will prove a real and great blessing to the Mussulmans of India.

13. Your letter and enclosures, together with the orders of Government thereon, will be printed as an appendix to the Educational Review, and also in the Selections from the Records of this Government.

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